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AGRICULTURE: LAND AND LIFE

YEAR THREE



Modules 1 - 4

LEARNING
FACILITATOR'S
MANUAL



**Agriculture: Land and Life
Year Three**

**LEARNING FACILITATOR'S
MANUAL**



NOTE: This Agriculture: Land and Life/Year Three Learning Facilitator’s Manual contains answers to teacher-assessed assignments; therefore, it should be kept secure by the teacher. Students should not have access to these assignments until they are assigned in a supervised situation. The answers should be stored securely by the teacher at all times.

This document is intended for	
Students	
Teachers (Agriculture: Land and Life/Yr 3)	✓
Administrators	
Parents	
General Public	
Other	

Agriculture: Land and Life/Year Three
Learning Facilitator’s Manual
Modules 1-4
Alberta Distance Learning Centre
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Teachers

Register with the Alberta Distance Learning Centre

The Alberta Distance Learning Centre is dedicated to upgrading and continually improving your Learning Facilitator's Manual so that it accurately reflects any necessary revisions we have had to make in the student module booklets, assignment booklets, or the sample final test. The types of revisions that will be made are those that make the course more accurate, current, or more effective.

The ADLC will send you the **latest enhancements or minor upgrades** for your Learning Facilitator's Manual if you return the following registration card to: Alberta Distance Learning Centre, Box 4000, Barrhead, Alberta, T7N 1P4, Attention: Instructional Design and Development.

✂

ADLC Learning Facilitator's Manual Registration Card	
First Name _____	Surname _____
School Name _____	School Phone Number _____
School Address _____	
City _____	Postal Code _____
Course Title _____	Approximate Date of Purchase _____

✂



You can help ensure that distance learning courseware is of top quality by letting us know of areas that need to be adjusted. Call the Alberta Distance Learning Centre free of charge by using the RITE line and ask for the Editing Unit. Also, a teacher questionnaire has been included at the back of most Learning Facilitator's Manuals. Please take a moment to fill this out.

We look forward to hearing from you!



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Introduction

A survey of these course materials will confirm that this new learning package has been specially designed for many kinds of teachers working in a variety of situations.

Which Category Do You Fit?

☐ Small Schools Teacher

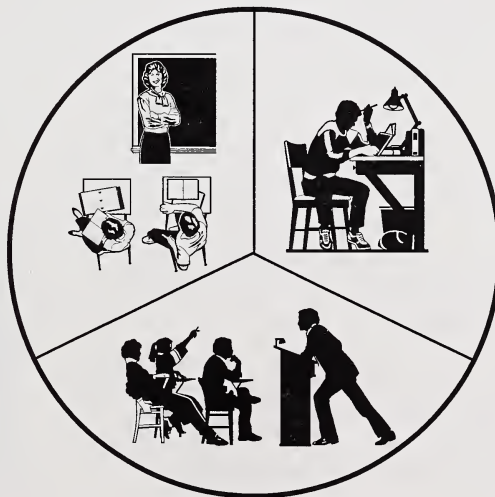
- ☐ inexperienced
- ☐ experienced, but in other subject areas
- ☐ experienced in teaching agriculture, but wanting to try a different approach

☐ Distance Learning Teacher

- ☐ travelling to schools within the jurisdiction
- ☐ using facsimile and teleconferences to teach students within the area

☐ Larger Schools Teacher

- ☐ inexperienced
- ☐ experienced in teaching agriculture, but wanting to try a different approach



Because these materials have been created by experienced classroom teachers and distance learning specialists, they have many advantages for students and teachers regardless of their situations.

Advantages for Students

- incorporates a strong learner-centred philosophy
- promotes such qualities in the learner as autonomy, independence, and flexibility
- is developed through media which suit the needs and circumstances of the learner
- reflects the experiential background of Alberta students
- opens up opportunities by overcoming barriers that result from geographical location
- promotes individualized learning, allowing learners to work at their own pace

Advantages for Teachers

- allows teachers maximum teaching time and minimizes preparation time
- includes different routes through the materials to suit different learners
- incorporates a wide range of teaching strategies, in particular those using independent and individual learning
- delivers curriculum designed by education specialists that reflects the Alberta Education Program of Studies with an emphasis on Canadian content
- provides learning materials which are upwardly compatible with advanced educational technology

Does it sound like something you could use?

This Learning Facilitator's Manual begins with an overview of the current Alberta Education Program of Studies for Agriculture: Land and Life. This summary is included for inexperienced teachers or those teachers who have found themselves teaching agriculture when their training is in other subject areas. This brief summary is not meant to replace the Alberta Education Program of Studies, but rather to help teachers confirm the highlights of the program.

Other parts of this introduction have also been included to help teachers become familiar with this new learning package and determine how they might want to use it in their classroom.

Beyond the introduction the guide itself contains answers, models, explanations, and other tips generated by the teachers who authored this course.

The module booklets, assignment booklets, and LFM's are the products of experienced classroom teachers and distance learning specialists. It is the hope of these teachers that their experience can be shared with those who want to take advantage of it.



Overview of the Program of Studies

The Agriculture: Land and Life program for junior high school students provides a three-year sequence of complementary courses. The objective of the program is to provide a broad awareness of the economic, social, and scientific realities of the agricultural enterprise. Learning is introduced in meaningful contexts through hands-on activities and print or media pathways. Through a variety of pathways, students can pursue their personal interests while broadening their understanding of the world in which they live.

The course has been designed to be of interest to both urban and rural students with a balance of perspectives including those of consumers, home gardeners, and workers in food production and processing.

The emphasis of the program is on awareness and insight rather than on specific skills.

Goals of the Agriculture: Land and Life Program

- to develop an awareness of the diversity of agricultural activity in students' local areas, in Alberta, and in the national and international communities
- to develop critical-thinking and problem-solving skills in the process of examining agricultural problems and practices
- to acquire knowledge about agricultural production and processing
- to recognize relationships between producers, processors, marketers, and consumers
- to appreciate agriculture for its economic significance, career opportunities, and for its impact on the quality of life
- to acquire knowledge and develop skills applicable to plant and animal care in both urban and rural settings
- to develop a resource management perspective, recognizing areas where personal and public decision making are needed
- to acquire an awareness of agricultural technologies, including an examination of emerging technologies as well as those of the past and present
- to develop an awareness of societal issues and concerns that are related to agriculture
- to develop an awareness of agriculture's scope in urban areas

Program Organization

The program content is organized into themes which are repeated over the three-year sequence. These themes are developed in a series of three modules for each year of the program. Students may enter the program at any year and complete these modules in any order. A final summary module “What Is Agriculture?” provides for a survey of agricultural activity at the local, provincial, national, and international level. The intent of this module is to utilize the ideas and skills from the preceding three themes to expand students’ knowledge of the scope of agriculture and to help students recognize the impact of agriculture on society. The students who have previously taken either year one or year two of agriculture are to do two personal interest projects instead of the survey. A suggested minimum time commitment for each module is included in the following table.

Theme	Year One	Year Two	Year Three
Production, Processing, and Marketing	Module 1 Milk and Milk Products 20 hours	Module 3 Meat and Meat Products 20 hours	Module 1 Field Crops and Energy 20 hours
Technology and Research	Module 2 People, Machines and Grain 20 hours	Module 2 Greenhouse Technology 20 hours	Module 2 Biotechnology 20 hours
Resource Management	Module 3 Managing Water Resources 20 hours	Module 1 Managing Soil Resources 20 hours	Module 3 Managing the Land 20 hours
Survey or Personal Interest Projects	Module 4 What Is Agriculture? 15 hours	Module 4 Part A: What Is Agriculture? or Part B: Project 1/Project 2 15 hours	Module 4 Part A: Survey What Is Agriculture? or Part B: Project 1/Project 2 15 hours

Overview of Agriculture: Land and Life/Year Three

The modules included in the Agriculture: Land and Life Year Three program are summarized as follows:

Module 1: Field Crops and Energy

This module examines the energy and resource inputs in relation to food production by using field crops as the example topic. The energy used in food production contributes in various ways to the final energy contained in the food product, but the food energy is usually small in relation to the large energy expenditures involved in the production and processing of the food.

Module 2: Biotechnology

This module examines how principles of genetics, artificial insemination, and embryo transplants, along with the use of growth supplements and other applications of biotechnology to plant and animal breeding programs can enhance existing breeds, or lead to the development of new high quality plant and animal products.

Module 3: Managing the Land

This module examines the scope and implications of land-use practices. It considers land uses within urban areas as well as rural areas. Management of lands can be a very complex process. Many competing forces and economic pressures are involved. A good deal of information, education, and insight is required to determine the best use of land. To a greater extent society plays a role in determining best land use so that the land passed on to future generations is in as good a condition, or better, than the land presently.

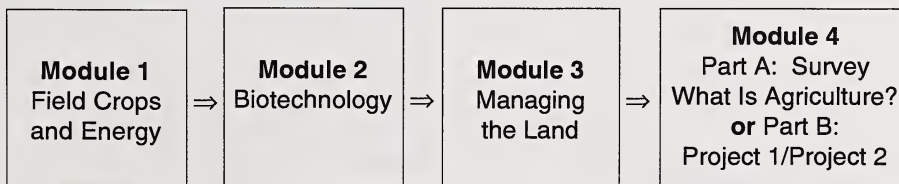
Module 4: Part A: Survey – What Is Agriculture? Part B: Project 1/Project 2

Part A is a comprehensive review of agricultural activity to provide students with a sense of its diversity and scope. The perspective adopted in Part A is that agriculture involves more than just the farm, and that the impact of agriculture can be seen in all of society. Part A examines agriculture at a variety of levels from local to global and introduces students to Alberta's role as both an importer and an exporter of agricultural commodities.

Part B provides an opportunity for students to learn more about areas of agriculture that interest them. Students are to select two projects to complete from a choice of projects involving topics on the business side of farming, computers and agriculture, world agriculture, agricultural systems and services, methods of food preserving and food processing, agricultural history, and home gardening.

Note: Students who previously completed the Agriculture: Land and Life Year One or Agriculture: Land and Life Year Two program and are now taking the Year Three program, **must** do Part B of Module 4.

Students who entered the Agriculture: Land and Life program at the Year Three level **must** do Part A of Module 4.

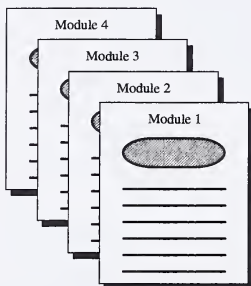


Structure of the Learning Package

Basic Design

This new learning package involves many other components in addition to the Learning Facilitator's Manual.

Modules



The print components involve many booklets called modules. These modules contain guided activities that instruct students in a relevant, realistic setting.

The modules have been specially designed to promote such qualities in the learner as autonomy, independence, and flexibility. Writers have incorporated such teaching strategies as working from the concrete to the abstract, linking the old to the new, getting students actively involved, and using advance, intermediate, and post organizers. Many other techniques enable learners to learn on their own for at least some of the time.

Contents
Overview Evaluation
Section 1 Activity 1 Activity 2 etc.
Section 2 Activity 1 Activity 2 etc.
Section 3 Activity 1 Activity 2 etc.
Section 4 Activity 1 Activity 2 etc.
Module Summary

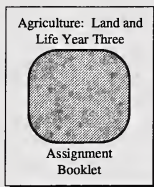
The structure of the module booklets follows a systematic design. Each module begins with a detailed table of contents which shows the students all the main steps. It acts as an organizer for students. The overview introduces the module topic or theme. A graphic representation has been included to help visual learners and poor readers. The introduction also states the weightings of each assignment.

The body of the module is made up of two or more closely related sections. Each section contains student activities that develop skills and knowledge centred around a theme.

The activities may involve print, audio, video, computer, or laser videodisc formats. At times the student and the learning facilitator are allowed to choose the activity that best suits the student's needs and interests. Other activities such as the Extra Help and Enrichment are optional pathways. This flexibility caters to each student's personal situation.

The summary focuses on the skills and strategies that the student has learned.

Assignment Booklet



Accompanying each module is an assignment booklet. The activities in these booklets can be used for formative and for summative assessments. The students should complete these assignment booklets when they have thoroughly reviewed the module materials. The assignment booklets have been designed for classroom use, for faxing, or for mailing. **If the booklets are not being mailed, you should remove the outside cover.**

Media



VIDEOCASSETTE

The package also includes references to media. Pathways have been developed so students can use a variety of media to achieve the objective. These different routes have been included to suit different learners. Wherever video references have been included, a print pathway is also available. This way, if the media resource isn't available or desired, a student can follow the print pathway and still successfully achieve the objective.

Textbooks and Reference Books

Module 3: Managing the Land has been designed to include references to the textbook, *The Living Soil: Land Use and Society*, by Sue Bland. (Weigl Educational Publishers Limited, Edmonton and Regina, 1991.) This textbook is available for purchase from the Learning Resources Distributing Centre (LRDC).

Land
Use and
Society

Materials, Media, and Equipment

Mandatory Components

Equipment (Hardware)	Media	Materials
		<ul style="list-style-type: none">• LFM for Agriculture: Land and Life Year Three• one complete set of module booklets (4) and assignment booklets (4) for each student• There is no final test.

Optional Components

Equipment (Hardware)	Media	Materials
<ul style="list-style-type: none">• VCR	Optional Videos – The list of videos is provided in the introduction to Modules 2, 3, and 4 in the suggested answer section of the LFM. There are no optional videos for Module 1. Students will have the names of the videos listed in the module booklets as part of Preparation (see Contents).	Some modules may require special materials or materials that can be acquired at certain times of the year. If such materials are needed they will be listed in the module booklets as part of Preparation (see Contents).

The optional videocassettes used in the course may be available from the Learning Resources Distributing Centre or ACCESS Network. Some of the videos may also be available through your regional district agriculture office. You may also wish to call your regional library service for more information.

Using This Learning Package in the Classroom

Conventional Classroom

Whether your classroom has desks in rows or tables in small groups, you may be most comfortable with a learning system that you can use with all your students in a paced style. In other words, you may want a package that will suit all of your students, so they can move through the materials as one group or several small groups. Because these materials contain different routes or pathways within each module, they can address various learning styles and preferences. The materials also include many choices within the activities to cater to different thinking levels and ability levels. Because of their versatility and flexibility, these materials can easily suit a conventional classroom.

Open-Learning Classroom

Open learning is the concept of opening up opportunities by overcoming barriers of time, pace, and place by giving the learners a package specially designed to enable them to learn on their own for at least some of the time.

Such a concept is not new. Many teachers can recite attempts to establish an individualized learning system as they recognized the importance of trying to personalize courseware to meet each individual student's needs. But these efforts often failed due to lack of time and lack of quality materials that conformed to Alberta specifications.

Due to advanced educational technology and improved Alberta-specific learning packages, a student-centred approach is now possible. Improved technology now allows us to provide support to learners individually, regardless of their pace or location. A teacher cannot be in twenty-eight places at one time offering guidance. However, media and a well-designed learning package can satisfy individual needs. Technology can also help provide an effective management system needed to track the students as they progress independently through the materials.

The key to a successful open-learning system depends on three vital elements: a learning package specially designed to enable students to learn effectively on their own for at least some of the time; various kinds of learner support; and a management system and style that ensures that the open-learning system runs smoothly.

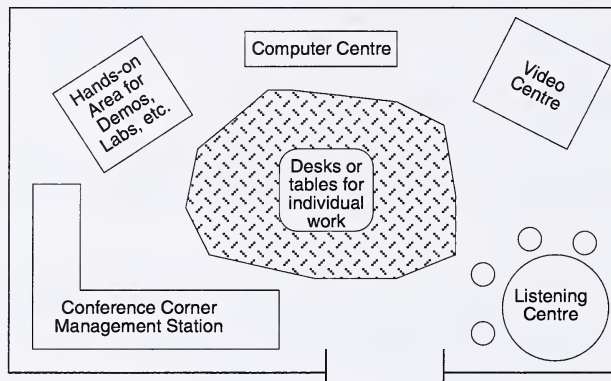
The Key to a Successful Open-Learning System



Learning Package

The specially designed learning package needed for a successful open-learning system has been developed for you. The objectives teach current Alberta specifications using strategies designed for individualized instruction. As the learning facilitator, you need to be sure to have all the components in the learning package available to students as needed.

If adequate numbers of media are available to satisfy the demand, a centre can be established for specific media.



You may not have the luxury to have enough hardware to set up a permanent video or computer centre in your classroom. In that case, students should be encouraged to plan ahead. Perhaps every three to five days they should preview their materials and project when they would need a certain piece of media. This would allow you to group students, if necessary, or reserve media as required.

Support

Support is definitely a key element for successful learning, and when you're planning an individualized, non-paced program, you need to carefully plan when and how support will be given.

The materials contain a form of consistent support by providing immediate feedback for activities included in the module booklet.

The answers, explanations, and examples for each of the module activities are included in this LFM. You may decide to set up an answer station with colour-coded cards, or you may want the students to come to you to discuss the activity together. As you and the student become more comfortable with an individualized system, you might increase the student's responsibilities – spot checking only to reinforce proper behaviour and to assess the student's day-to-day progress.

As the learning facilitator, you may be needed to offer more personal guidance to those students having difficulty, or you may need to reinforce the need for students to do these activities carefully before attempting the assignments in the assignment booklet.

The activities include choices and pathways. If a student is having difficulty, you may need to encourage that student to work on all the choices rather than one. This would provide additional instruction and practice in a variety of ways.

Another form of support is routine contact with each individual. This might be achieved with a biweekly conference scheduled by you, or as students reach a certain point (e.g., after each section is completed), they may be directed to come to the conference area.

Special counselling may be needed to help students through difficult stages. Praise and encouragement are important motivators, particularly for those students who are not used to working independently.

Direct teaching may be needed and scheduled at certain points in the program. This might involve small groups or a large group. It might be used to take advantage of something timely (e.g., election, eclipse, etc.), something prescheduled like the demonstration of a process, or something involving students in a hands-on, practical experience.

Support at a distance might include tutoring by phone, teleconferencing, faxing, or planned visits. These contacts are the lifeline between learners and distance education teachers, so a warm dialogue is essential.

Management

Good management of an open-learning system is essential to the success of the program. The following areas need action to ensure that the system runs smoothly:

- **Scheduling, Distributing, and Managing Resources** – As discussed earlier, this may require a need for centres or a system for students to project and reserve the necessary resources.
- **Scheduling Students** – Students and teachers should work together to establish goals, course completion timelines, and daily timelines. Although students may push to continue for long periods of time (e.g., all morning), teachers should discourage this. Concentration, retention, and motivation are improved by taking scheduled breaks.
- **Monitoring Student Progress** – You will need to record when modules are completed by each student. Your data might also include the projected date of completion if you are using a student contract approach.



Sample of a Student Progress Chart

Agriculture: Land and Life/ Year Three		Module 1	Module 2	Module 3	Module 4
<i>Billy Adams</i>	P				
	A				
<i>Louise Despins</i>	P				
	A				
<i>Violet Klaissian</i>	P				
	A				
P = Projected Completion Date A = Actual Completion Date					

The student could keep a personal log as well. Such tracking of data could be stored easily on a computer.

- Recording Student Assessments – You will need to record the marks awarded to each student for work completed in each module assignment booklet. The marks from these assignment booklets will contribute to a portion of the student's final mark. Other criteria may also be added (a special project, effort, attitude, etc.). Whatever the criteria, they should be made clear to all students at the beginning.

Sample of a Student Assessment Chart

Agriculture: Land and Life/ Year Three	Module 1	Module 2	Module 3	Module 4	Final Mark
<i>Billy Adams</i>	67	65	54	47	58
<i>Louise Despins</i>	43	50	54	55	51
<i>Violet Klaissian</i>	65	65	66	68	66

Letter grading could easily be substituted.

- Recording Effectiveness of System – Keep ongoing records of how the system is working. This will help you in future planning.

Sample of a System Assessment Chart

Module 1			
Date	Module Booklet	Assignment Booklet	Resources/Media

The Role of the Teacher in an Open-Learning Classroom

The teachers in a conventional classroom spend a lot of time talking to large groups of learners. The situation in open learning requires a different emphasis. Teachers will probably meet learners individually or in very small groups.

With this approach it is necessary to move beyond the idea of a passive learner depending largely on a continually supportive teacher. The teacher must aim to build the student's confidence, to stimulate the learner into self-reliance, and to guide the learner to take advantage of routes that are most meaningful and applicable to the learner.

These materials are student-centred, not teacher-centred. The teacher needs to facilitate learning by providing general support to the learner.

Evaluation

Evaluation is important to the development of every learner. Data gathering and processing, and decision making, at the student and teacher level, serve as means of identifying strengths and weaknesses.

These specially designed learning packages contain many kinds of informal and formal evaluation.

Observation

In the classroom the teacher has the opportunity to see each student perform every day and to become aware of the level and nature of each student's performance.

Observations are more useful if they are recorded in an organized system. The following list of questions is a sample of types of observations and how they can be collected.

Observation Checklist

	B. Adams	L. Despina	V. Klaissian	H. Smith	K. Dalley
1. Does the student approach the work in a positive manner?					
2. Is the student struggling with the reading level?					
3. Does the student make good use of time?					
4. Does the student apply an appropriate study method?					
5. Can the student use references effectively, etc.?					

Observation may suggest a need for an individual interview with a student.

Individual Conferences

Individual conferences may be paced (scheduled) by the calendar, at certain points in the module, or they may be set up only as needed or requested.

During these conferences teachers can determine the student's progress and can assess the student's attitudes toward the subject, the program, school, and self, as well as the student's relationship with other students. With guided questions the teacher can encourage oral self-assessment; the student can discuss personal strengths or weaknesses in regard to the particular section, module, or subject area.

Self-Appraisal

Self-appraisal helps students recognize their own strengths and weaknesses. Through activities that require self-assessment, students also gain immediate feedback and clarification at early stages in the learning process. Teachers need to promote a responsible attitude toward these self-assessment activities. Becoming effective self-assessors is a crucial part of becoming autonomous learners. By instructing, motivating, providing positive reinforcement, and systematically supervising, the learning facilitator will help students develop a positive attitude toward their own progress.

For variation, students may be paired and peer-assessing may become part of the system. The teacher may decide to have the student self-assess some of the activities, have a peer assess other activities, and become directly involved in assessing the remainder of the activities.

When the activities have been assessed, the student should be directed to make corrections. This should be made clear to students right from the start. It is important to note the correct association between the question and the response to clarify understanding, aid retention, and be of use for study purposes.

Many of the activities include choices for the student. If the student is having difficulty, more practice may be warranted, and the student may need to be encouraged to do more of the choices.

Each section within a module includes additional types of activities called Extra Help and Enrichment. Students are expected to be involved in the decision as to which pathway best suits their needs. They may decide to do both.

Self-appraisal techniques can also be introduced at the individual conferences. Such questions as the following might be included:

- What steps are you taking to improve your understanding of this topic?
- What method of study do you use most?
- How do you organize your material to remember it?
- What steps do you follow when doing an assignment?
- What could you do to become an even better reader?
- Do you have trouble following directions?
- Did you enjoy this module?

A chart or checklist could be used for recording responses.

Informal Evaluation: Assignments

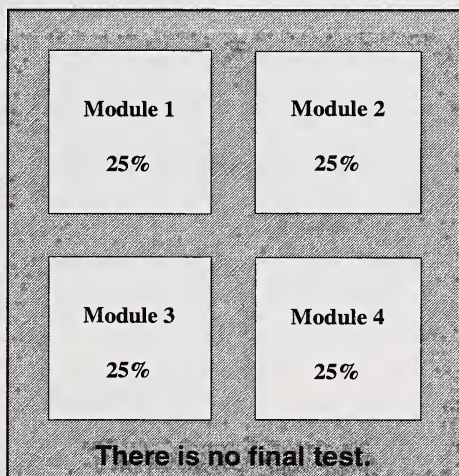
Informal evaluation, such as the assignments included in each module, are an invaluable aid to the teacher. They offer ongoing assessment information about the student's achievement and the behaviour and attitudes that affect that achievement.

Each module contains a separate booklet called the Assignment Booklet. This booklet assesses the knowledge or skills that the student has gained from the module. **The student's mark for the module may be based solely on the outcome of learning evident in the assignment booklet; however, you may decide to establish a value for other variables such as attitude or effort.** It is important that you establish at the beginning which outcomes will be evaluated, and that all students clearly understand what is expected.

Final Mark

There is no final test for Agriculture: Land and Life/Year Three.

The final mark may be determined by averaging the marks of the four modules. The value of each module is the decision of the classroom teacher. Following is one suggestion:



Introducing Students to the System

Your initiation to these learning materials began with a basic survey of what was included and how the components varied. This same process should be used with the class. After the materials have been explored, a discussion might include the advantages and the disadvantages of learning independently or in small groups. The roles of the students and teacher should be analysed. The necessary progress checks and rules need to be addressed. Your introduction should motivate students and build a responsible attitude toward learning autonomously.

Skill Level

It is important for students to understand that there are certain skills that they will need in order to deal successfully with the course materials. They are listed below:

- understanding and using instructional materials (table of contents, index, list of illustrations, appendices, bibliography, and glossary)
- interpreting maps, graphs, and charts
- using reference materials
- recognizing special symbols
- using a calculator

Other general skills are using reliable study methods, outlining, and learning to read at a flexible rate.

To decide the level and amount of instruction needed to accommodate the varied levels among students, you may wish to prepare and administer skill inventories or pretests. If most students need help with a particular skill, you may want to plan a total class instructional session. If only certain students lack a skill, you may want to set up a temporary skill group to help students who need it, or you may want to develop a skills file for this purpose.

Reading Level

These course materials are largely print based, but poorer readers need not be discouraged. It is important that you assure the students that these materials have been designed for easy reading. The authors have employed special strategies that lower and control the reading level. Some of them are

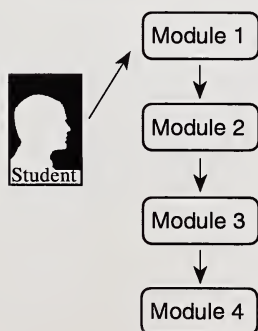
- the conscious selection of vocabulary and careful structuring of sentences to keep the materials at an independent reading level
- the integration of activities, examples, and illustrations to break text into appropriate-sized chunks
- the inclusion of many kinds of organizers (advance, graphic, intermediate, concept mapping, post organizers) to help give students a structure for incorporating new concepts

- the recognition that vocabulary and concepts are basic to understanding content materials and, thus, must be handled systematically (defined in context, and often in a specialized glossary in the Appendix)
- the acknowledgement that background knowledge and experience play a vital role in comprehension
- the systematic inclusion of illustrations and optional videos to help poorer readers and visual learners, as an alternative to print-based learning
- a variety of formats (paragraphs, lists, charts, etc.) to help poorer readers who do not absorb or retain main ideas easily in paragraph format
- the inclusion of media and activity choices to encourage an active rather than passive approach
- instruction in a meaningful setting rather than in a contrived, workbook style
- using purposeful reading, viewing, and doing to produce better interpretation of the course materials
- the recognition that students need structured experiences when reading, viewing, or listening to instructional materials: developing pupil readiness, determining the purpose, providing guided instruction and feedback, rereading if necessary, and extending (This structure closely resembles the reading process.)

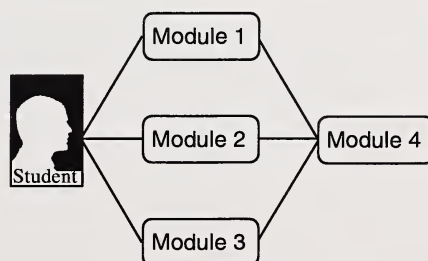
To help make the learning package more readable, you can begin your module preparation by reading (previewing) all the related materials that are going to be used. You need a solid background in order to assess and develop a background knowledge for students. The students' experiential bases may be assessed through brainstorming sessions concerning the topic, or by using visuals and guided questions to predict what the topic might be about.

Modules 1, 2, and 3 are self-contained. Students may work on any of these modules in any order. However, in terms of Module 4, students doing Part A of Module 4 should do Module 4 last, as it acts as a summary or culmination; students doing Part B of Module 4 may work on Module 4 in conjunction with any of the other modules.

Students Doing Part A of Module 4



Students Doing Part B of Module 4



As the learning facilitator you have a key role in determining the success your students have in taking this course. Students need encouragement and the confidence of knowing that the course is important to their futures. At times, they also need help to clear up misunderstandings or to confirm that what they are doing is correct.

After the introductory pages of each module there are suggested answers, models, explanations, and other tips generated by teachers who authored this course. However, for more detailed instructions to the activities, the learning facilitator will need to refer to the information in the Student Module Booklet.

Correct and discuss the answers with the student as the student completes each activity. Answers to parts of some of the activities can be self-corrected by the student by having the student refer to the suggested answers in the Appendix. In this way the student receives immediate feedback to clarify and reinforce his or her basic understanding before he or she moves on to the next activity.

The main concepts that students are to learn in each section are stated at the beginning of each section in the Learning Facilitator's Manual. If the learning facilitator wishes to have a more complete guide as to the attitudes, skills, and other learner expectations which students are to achieve, he or she will need to refer to the Junior High School Program of Studies.

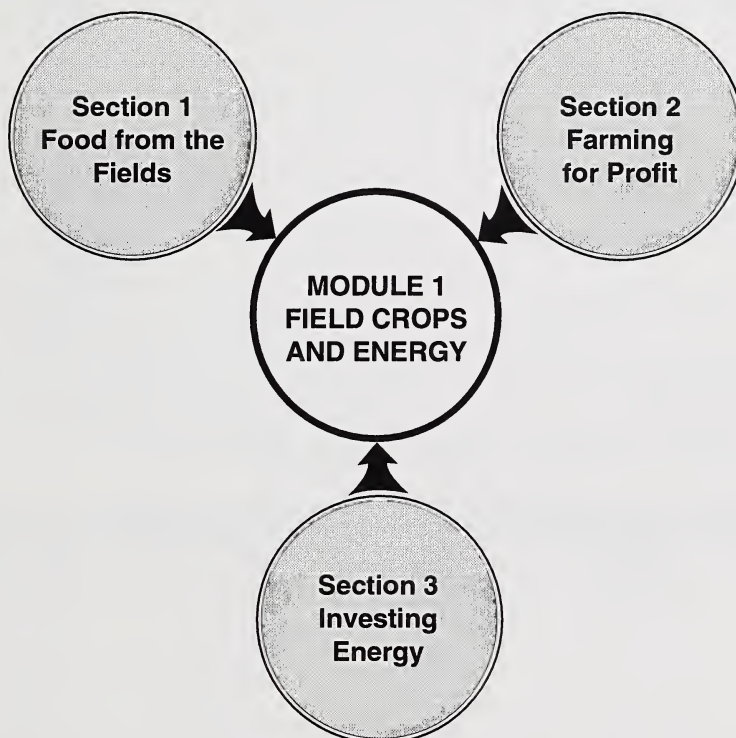
Towards the end of each section there are Follow-up Activities. Here the activities are separated into two strands: Extra Help and Enrichment. If students had some difficulties understanding the concepts and the activities, it is recommended that they do the Extra Help. If students had a clear understanding of the concepts and had few difficulties completing the activities, it is recommended that they do the Enrichment. As the learning facilitator, you should assist students in choosing the appropriate path.

The Learning Facilitator's Manual also includes the answers to the assignments in the assignment booklets. Remember that the answers to the assignments should be kept secure by the teacher. Students should not have access to the assignment booklet answers. These answers should be stored securely and retained by the teacher at all times.

Module 1: Field Crops and Energy

Overview

This module uses a case study approach. The intent of this module is to provide a practical examination of production, processing, and marketing aspects by using field crops as the example topic. The theme is similar to the one used in Module 1: Year One, and in Module 3: Year Two of the Agriculture: Land and Life program; however, the consumer emphasis of the year-one program and the nutrition emphasis of the year-two program has been replaced by an emphasis on energy. Energy and resource inputs in relation to food production are examined. The energy used in food production contributes in various ways to the final energy product, but this energy is generally small in relation to the large energy expenditures involved in production and processing.



Evaluation

The student's mark in this module will be determined by his or her work in the Assignment Booklet, which contains three section assignments. The mark distribution is as follows:

Section 1 Assignment	25 marks
Section 2 Assignment	40 marks
Section 3 Assignment	35 marks
TOTAL	100 marks

Section 1: Food from the Fields

Key Concepts

- identification of a variety of field crops
- classification of field crops into groups based upon their common physical properties and the uses made of each crop
- familiarization with the products produced from each group and their uses
- comparison of the food energy found in several primary and secondary field crop products

Section 1: Activity 1

1. and 2. Students are asked to name crops by identifying the pictures on each of twenty-four cards. They are to check their own answers and complete the missed responses by turning the pictures over and finding the answers on the backs of each card.

Ensure that the students have read the information about cereal grains, oilseed crops, vegetable crops, pulse crops, and forage crops before they attempt to answer questions 3 and 4.

3. Answers may include the following:

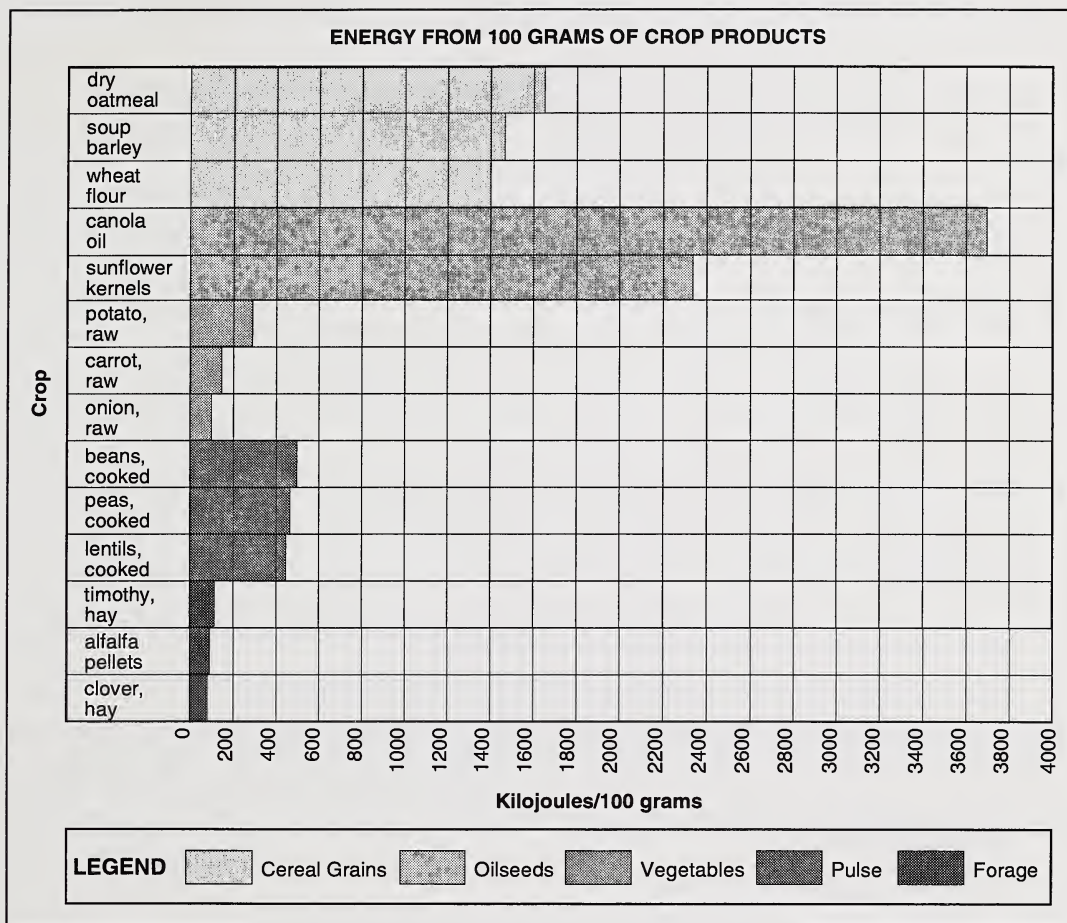
- | | |
|---|--|
| <ol style="list-style-type: none"> a. <ul style="list-style-type: none"> • small hard seeds • human or animal food • Secondary products are flour, bran, and germ. b. <ul style="list-style-type: none"> • human and animal food • Secondary products are oil and meal. c. <ul style="list-style-type: none"> • edible seed, flowers, roots, tubers, stems, or leaves • human and animal food • raw or processed products | <ol style="list-style-type: none"> d. <ul style="list-style-type: none"> • large edible seeds • human or animal food • nitrogen-fixing e. <ul style="list-style-type: none"> • The whole green plant is harvested. • animal feed only • grazing crop • hay • silage • pellets |
|---|--|

4. The object of this exercise is to classify various crops into the five given categories.

Cereal Grains	Oilseed Crops	Vegetable Crops	Pulse Crops	Forage Crops
wheat	canola	potato	faba bean	timothy
barley	safflower	carrot	field pea	alfalfa
oats	flax	cabbage	lentils	brome grass
corn	sunflower	sugar beet	field bean	fescue
rye	mustard	onion	XXXXXX	clover

Section 1: Activity 2

1. The student has to look at the values given in the table accompanying the bar graph and transfer those values to the graph, drawing a horizontal line for the crop product corresponding to the value given along the bottom (labelled "Kilojoules/100 grams") of the graph. The bars should then be coloured in or shaded according to category.



- The total number of kilojoules consumed was 8000.
- You would need to obtain 4000 kilojoules of food energy from breakfast and the midday meal to have eaten a total of 12 000 kJ of food energy in one day.

Section 1: Follow-up Activities

Extra Help

- The purpose of using the pictures of crops once more is to review the five types of crops. The student is to check in the Appendix of the Student Module Booklet as to which crops belong to each of the five different types of field crops. The student should understand the characteristics of each classification before moving on.
 - Students are to check their own answers to the crossword puzzle by referring to the Appendix in the Student Module Booklet.
- Other answers to questions 3. to 6. are acceptable if the student can prove their accuracy by referring to a source, such as an encyclopedia.
- Field crops which make oil products include sunflower, safflower, canola, flax, and mustard crops.

4. Wheat, oats, barley, rye, and corn can be used to make bread.
5. Beans, peas, and lentils produce large seeds used to make soups.
6. Field crops found in stores include potatoes, carrots, onions, and cucumbers.

Enrichment

1. a. $90 \text{ kJ} \times \frac{0.1\text{¢}}{\text{kJ}} = 9\text{¢} (\$0.09)$ f. $3700 \text{ kJ} \times \frac{0.1\text{¢}}{\text{kJ}} = 370\text{¢} (\$3.70)$
 b. $1400 \text{ kJ} \times \frac{0.1\text{¢}}{\text{kJ}} = 140\text{¢} (\$1.40)$ g. $155 \text{ kJ} \times \frac{0.1\text{¢}}{\text{kJ}} = 15.5\text{¢} (\$0.16)$
 c. $170 \text{ kJ} \times \frac{0.1\text{¢}}{\text{kJ}} = 17\text{¢} (\$0.17)$ h. $2350 \text{ kJ} \times \frac{0.1\text{¢}}{\text{kJ}} = 235\text{¢} (\$2.35)$
 d. $450 \text{ kJ} \times \frac{0.1\text{¢}}{\text{kJ}} = 45\text{¢} (\$0.45)$ i. $280 \text{ kJ} \times \frac{0.1\text{¢}}{\text{kJ}} = 28\text{¢} (\$0.28)$
 e. $1650 \text{ kJ} \times \frac{0.1\text{¢}}{\text{kJ}} = 165\text{¢} (\$1.65)$ j. $480 \text{ kJ} \times \frac{0.1\text{¢}}{\text{kJ}} = 48\text{¢} (\$0.48)$
2. a. Oilseeds (canola, sunflower) produce the highest levels of food energy.
 b. Forage crops (alfalfa), followed by vegetables, tend to produce the lowest levels of food energy.
3. Making a toilet paper model representing Alberta hectarages is meant to be a fun activity. One square of paper represents 40 000 hectares. Dividing the total hectarage for each crop by 40 000 determines how many squares of paper are required.

Note: The student should now read the Conclusion for this section and complete the Section 1 Assignment in the Assignment Booklet.

Section 1: Assignment Answer Key (25 marks)

1. Three marks should be awarded for each of parts a. to e., one mark for each different point. For example, under cereal grains, one mark will be given if the student states that a secondary product is flour, but no extra marks will be awarded if the student states that bran and germ are also secondary products. Sample answers follow.
 - a. Cereal grains share these characteristics:
 - They are made of small, hard seeds.
 - They are used for both human and animal food.
 - Flour, bran, and germ are secondary products. **(3 marks)**
 - b. Oilseeds have the following characteristics in common:
 - They are used to produce edible oil for human use.
 - Meal is used as livestock feed.
 - Oil and meal are secondary products. **(3 marks)**
 - c. Vegetables share the following characteristics:
 - All have edible flowers, seeds, roots, tubers, stems, or leaves.
 - They are used for human and animal food.
 - They are harvested for raw or processed products. **(3 marks)**

d. Pulse crops have the following characteristics in common:

- They are large, edible seeds.
- Pulse crops are used for both human and animal foods.
- They are nitrogen-fixing.
- They can be grown for silage. **(3 marks)**

e. Forage plants share these characteristics:

- The whole green plant is harvested.
- The plants are only used for animal feed.
- They are grown for grazing crops, hay, silage, and pellets. **(3 marks)**

2. Oilseeds have the highest food energy level. **(1 mark)**

3. Forage crops is the correct answer. **(1 mark)**

4. Mustard, sunflower, canola, safflower, and flax are oilseed crops studied in this course. **(1 mark)**

5. Lentils have been cultivated for at least 4000 years. **(1 mark)**

6. Flax is sometimes grown to make linen from its fibre. **(1 mark)**

7. Sugar beets need to be processed. **(1 mark)**

8. Legumes or pulse crops produce nitrogen in the soil. **(1 mark)**

9. An average family eats five hundred kilograms of fruits and vegetables in one year. **(1 mark)**

10. An average Grade 9 student consumes 12 000 kJ of food energy per day. **(1 mark)**

11. One glass of 2% milk contains 550 kJ of energy. **(1 mark)**

Section 2: Farming for Profit

Key Concepts

- reviewing the natural conditions in Alberta that determine the suitability of various field crops for different locations
- discovering that farmers invest in energy, which has a price tag, in order to produce food
- learning how farming operations can be organized in different ways to limit input energy costs
- analysing how farmers may save energy input costs and enhance their chances of making profits by processing and packaging food products by themselves
- analysing patterns of energy use for farms with different operations
- learning what effect changing world oil prices have upon the energy input costs on farms
- examining a method of increasing energy inputs to turn a low-value crop product into a high value product

Section 2: Activity 1

This activity is designed to remind the student that natural conditions influence the decisions of farmers in terms of which field crops to grow. Natural energy inputs include sunlight, soil nutrients, and water.

1. The map is to be coloured as described in the legend. Have the student read the legend aloud.
2. This exercise requires research. Inferences can be drawn about the conditions favoured by particular crops by reviewing the conditions found near locations centred in areas where particular crops predominate. Encourage students to read the articles found in the Appendix, Section 2: Activity 1, and to interview you or another resource person to gather further information.
 - a. Edmonton is a barley area for the following reasons:
 - Barley grows well in heavy, fertile soils such as those found in the Edmonton region.
 - Barley needs 90 to 100 frost-free days per year with high, regular precipitation of 37 cm to 50 cm annually.
 - Barley crops prefer cool and warm (but not hot) days.
 - There is a large, local barley market in the Edmonton area for animal feed.
 - b. Fairview is a great canola-growing area due to the following:
 - Most soil types in the region are suitable for growing canola and there is adequate rainfall.
 - Canola is adaptable to the acidic and salty parkland soils.
 - Cool night temperatures are preferred by canola which matures quickly (90 to 100 days).
 - High harvest value is suited to smaller, mixed farms found in the Fairview area.
 - c. Taber is great for growing corn due to the following:
 - It is in the hottest part of the province, and corn requires high summer heat values.
 - Corn requires good moisture which is available from irrigation.
 - A long frost-free season (100 to 115 days) is required.
 - Corn is wind pollinated – Taber is in a windy area.
 - Farmers are experienced with row cropping in the Taber area.
 - d. Rocky Mountain House is a centre for cattle raising for the following reasons:
 - It has a growing season too short for most cereal crops so forage crops are widely grown.
 - A lot of marginal land in the area is unsuited for cereal grains.
 - Areas of range, bush cover, and rough grazing land are suitable for raising beef cattle.
 - Rocky Mountain House is close to barley-producing areas – barley is a supplementary source of cattle feed.
 - Forage products are produced in the area.
 - The area includes many mixed farms which are close to commercial beef-feeding operations and markets.
 - e. Lethbridge is a wheat-growing hub due to the following:
 - The area has brown soils which are ideal for growing wheat.
 - There are well-drained soils.
 - Good spring precipitation promotes germination.
 - Wheat is a dryland crop.
 - Wheat needs a long growing season of frost-free days (Lethbridge averages 100 to 115 days).
 - Wheat needs high minimum summer heat and adequate annual precipitation (20 to 37 cm).
 - The Lethbridge area produces high-quality bread wheat.

Section 2: Activity 2

Vertical integration refers to farm operations which not only grow crops, but process and market them as well. The flow chart “Energy Inputs Needed to Produce an Alfalfa Sprout Salad” shows over thirty steps. If most of the energy inputs are completed on the farm site, then various steps in the process are not necessary. It is important that students understand that the elimination of an expense results in a larger profit for the farmer.

This activity is the Section 2 Assignment question 1, so you should not correct the student’s work, but you may assist if necessary.

Section 2: Activity 3

Compare the two graphs. On both farms energy is used to operate and purchase a house; both farms have transportation expenses and both have production costs.

1. Heating, electricity, construction, vehicle manufacture, gasoline, diesel fuel, and equipment (machinery) manufacture are the seven energy inputs found on both graphs.
2. Among other things, vehicles are required to transport products to market, service the farm, transport workers, and provide for the delivery of goods to the farm.
3. On a dryland grain farm 60.2% of the total energy is used for fuel and heating (11.4% + 9.4% + 12.1% + 11.8% + 15.5%). On a cow-calf beef farm 55.1% of the total energy is used for fuel and heating (34.1% + 16.8% + 4.2%).
4. Oil is the main supplier.

Section 2: Activity 4

You may wish to discuss the stock market concept with students. Note that an increased demand for actual products to back commodity sales on the stock market can cause the price of the products to rise. A lack of demand depresses the price. Since oil products are one of the main energy sources in agricultural production, farm energy input costs are affected by price fluctuations in oil.

- 1.–3. The student exercise relates how to calculate the answers for the chart, but the concept of gigajoules may be confusing. Use the following comparisons if necessary:

4.2 J of heat raises the temperature of one gram of water 1°C.

4.2 kJ of heat raises the temperature of one litre of water 1°C.

An average adult’s food intake produces 6000 kJ of heat energy daily.

A megajoule (1000 kJ) is one million joules.

A gigajoule (1 000 000 kJ) is one billion joules. *Giga* is derived from the root word of gigantic.

Approximately six billion joules (or six gigajoules) of heat are produced by one barrel of oil. This is why the total farm energy consumption stated in gigajoules (GJ) can be divided by six to calculate barrels.

The table and the answers follow:

EFFECTS OF RISING OIL PRICES ON FARM ENERGY COSTS				
	1	2	3	4
Farm Type	Total Energy Use per Year	Equivalent Number of Barrels of Oil	Increased Energy Cost if Barrel Price went up \$1	Increased Cost if Barrel Price went up \$10
Example	3000 GJ	$3000 \div 6 = 500$ barrels	$500 \times \$1 = \500	$500 \times \$10 = \5000
Dryland Grain	2790 GJ	465 barrels	\$465	\$4650
Cow-Calf Beef	10 770 GJ	1795 barrels	\$1795	\$17 950

4. The table titled “Effects of World Oil Prices on Unit Energy Costs” is a reference to help the student answer the questions as follows:
 - a. There will be a 72¢ increase in the price of energy inputs for each hectare on a dryland farm.
 - b. There will be an extra \$720 energy charge.
 - c. The energy bill will cost an extra \$17 700 for the year.
5. This information could be used to plan finances. Increased energy costs can turn a profitable operation into a losing proposition if such things are not considered.

Section 2: Follow-up Activities

Extra Help

If students have difficulty visualizing the concept of “process” or step-by-step energy inputs to produce a field-crop-related product, have them complete Extra Help. The following is a reference for the learning facilitator.

Answers may vary but should be similar to the flow chart referred to in Activity 2 except that corn would be substituted for alfalfa. A typical answer copying the relevant steps of the flow chart may be:

Farm: The six steps would be the same (substitute *corn seed* for *alfalfa seed*).

Seed Storage:

- cleaning
- storage
- grading for sale
- transporting to processing plant

Hydroponic Greenhouse: All steps are eliminated (substitute washing *corn* for *sprouts*).

Processing Plant: All seven steps are the same.

Food Storage: Four steps are the same.

Consumer: All steps are the same.

Enrichment

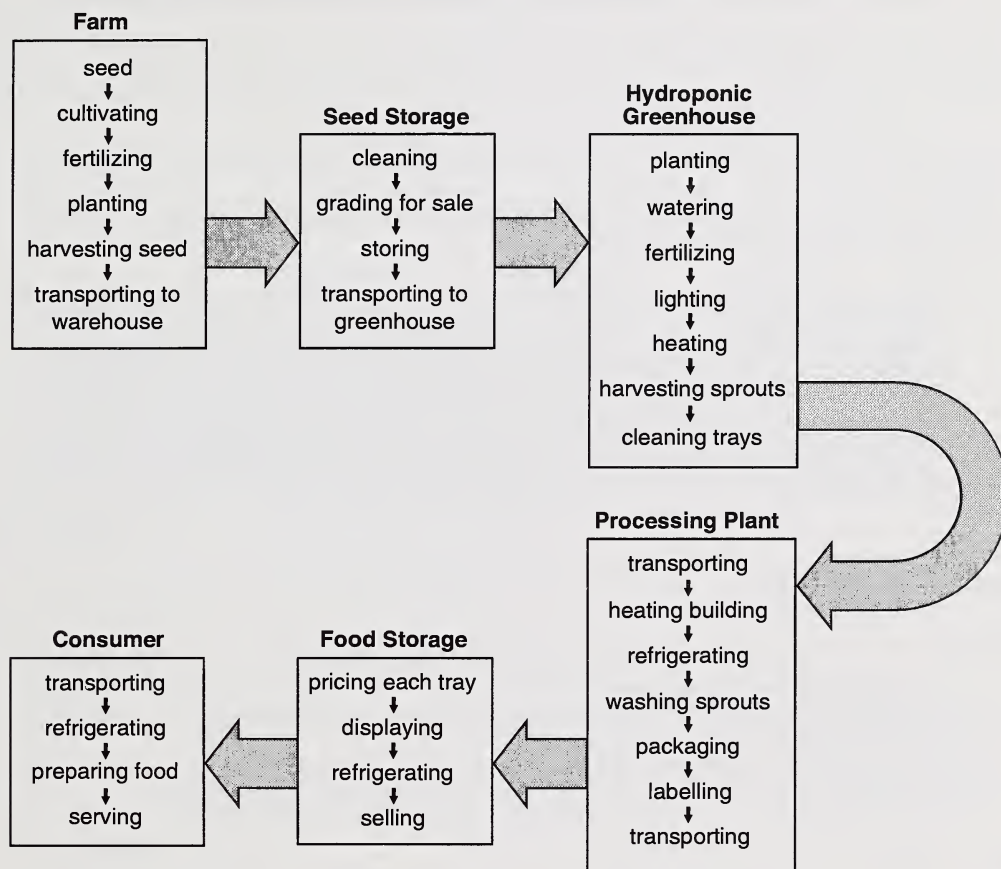
After students read the introduction help them study the advertising information article “The Grass Generator” found in Section 2 of the Appendix.

1. Energy inputs include the following:
 - purchasing price of the unit
 - providing a concrete pad
 - assembling the Grass Generator unit
 - modifying the water supply
 - providing water
 - providing seed
 - seed cleaning
 - specifying in writing the type of livestock being fed
 - providing labour
 - paying for electricity
 - providing maintenance and service for equipment
 - paying loan interest
2. Savings will include the following:
 - livestock weight gains
 - more milk production
 - labour
 - releases pasture lands for other crops
 - improved breeding success
 - higher survival rate for young animals
 - lower veterinary bills
 - fewer machine purchases
 - cuts costs of feed grain and supplements
 - time
 - permits capital cost write-off on income tax statements
 - energy
3. Low energy costs plus high feed and beef prices will determine success.

Note: The student should now read the Conclusion for this section and complete the Section 2 Assignment in the Assignment Booklet.

Section 2: Assignment Answer Key (40 marks)

1. The response to this question may be given in direct reference to the flow chart appearing in Section 2: Activity 2. For your convenience this chart is reproduced here in full. The following sample answers refer to changes made to different stages of the flow chart if a vertical integrated system is used by the farmer. Give two marks for each valid point supported by a reason.



Farm: Transportation costs will be greatly reduced because the seed storage site will be on the farm.

Seed Storage:

- Grading will be eliminated as a necessity because the seed will be used, not sold to another party.
- The greenhouse is on the farm so transportation costs will be greatly reduced.

Hydroponics Greenhouse: Some water usage will be deleted because processing-plant water can be used to water the growing plant sprouts.

Processing Plant:

- This plant is likely to be joined to the greenhouse and will therefore eliminate one of the heating steps. Heat from the greenhouse can be used.
- Packaging and labelling are two more steps that will be eliminated because the sprouts can be sold in bulk.

Food Storage: Pricing each tray and displaying are two steps that will be eliminated because only one bulk sale has to be made.

Consumer: Transportation costs will be reduced because the processing plant will likely make fewer deliveries of the sprouts because of bulk orders. **(20 marks)**

2. Student answers are to appear in a letter format. Since this is a mixed farm, reasonable expense entries for both crop production and animal production are necessary. Allow five marks for using letter format and proper communication skills and give up to fifteen marks for expense entries, one mark for each expense mentioned. To ease checking, sample expenses, which apply to mixed farming, are listed under the following common headings:

Farm Home:

- heating
- electrical
- construction

Crop Production:

- machine or equipment manufacture
- storage, barns, fences
- pesticides and herbicides
- fuel
- fertilizer

Transportation:

- vehicle manufacture
- fuel

Animal Production:

- machinery or equipment manufacture
 - barn, fences, and storage
 - fuel
 - purchased grain and concentrate
- (20 marks)**

Section 3: Investing Energy

Key Concepts

- reviewing the foods consumers need for proper nutrition
- studying the effect of consumer preferences on the processing, packaging, and marketing of foods
- surveying the home to find what processed foods are preferred
- examining ingredients in several processed foods
- learning to recognize primary, secondary, and tertiary products derived from field crops and animals
- learning how processing increases the value of products to producers and their cost for consumers

Section 3: Activity 1

1. The student is directed to read the page taken from Canada's Food Guide to Healthy Eating. Discuss the concept that servings can consist of a variety of foods in varying amounts. However, each serving contains similar amounts of kilojoules of energy. The student should use the higher number of required servings to meet the energy needs of an adolescent.

The following is a plan of what a student can eat today:

- three to four servings of milk or milk products (yogourt, cheddar or processed cheese, ice cream, cereal cream, cottage cheese, cream soups, etc.)
- two to three servings of meat, fish, poultry, or alternatives (peanut butter, cooked peas, beans, lentils, cottage cheese, or cheddar cheese)
- five to twelve servings of grain products (bread, cereal, rice, pasta)
- five to ten servings of fruit (or fruit juice) and vegetables (salad, juices)

2. Encourage the student to locate all the food they have on hand in the house within the cupboards, fridge, freezer, and in containers such as canisters.

The student is to complete the chart labelled "Food in Our House." The chart is not reproduced here because answers will vary. Check to see if the foods are listed under the correct heading, and that only Alberta-made products are circled.

Section 3: Activity 2

The student has to examine the list of contents of nine processed foods. Definitions of many of the chemicals and other terms are found in the Appendix. Have the student look up these words.

1. Students should have one check mark for each ingredient. A case can be made that some ingredients could be placed in more than one category but basically the chart should look similar to the following:

INGREDIENTS IN PREPARED FOOD PRODUCTS

Generic Name	Field Crops				Animals		Additives			
	Cereal Grains	Vegetable Oil	Fruit and Vegetables	Pulse Grains	Milk	Meat and Animal Fats	Yeast	Spices, Flavouring, Colouring	Preservatives	Vitamins, Minerals, Water
Potato Chips		✓	✓					✓	✓	
Cornflakes	✓ ✓							✓ ✓	✓	✓ ✓
Mushroom Soup	✓ ✓	✓	✓ ✓		✓ ✓		✓	✓ ✓	✓ ✓	✓
TV Dinner	✓ ✓	✓	✓ ✓ ✓		✓	✓ ✓		✓ ✓ ✓		✓
Chicken Coating	✓ ✓	✓					✓	✓ ✓ ✓		
Bacon						✓		✓ ✓ ✓	✓ ✓ ✓	✓
Baby Biscuits	✓ ✓	✓				✓	✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓
Baked Beans			✓ ✓	✓		✓		✓ ✓ ✓	✓	✓
Stew		✓	✓ ✓			✓		✓ ✓ ✓	✓	✓

2. Answers may vary but generally people prefer foods with so many ingredients because of flavour, freshness, and variety.

Section 3: Activity 3

Be sure students have a clear understanding of the terms *primary*, *secondary*, and *tertiary*. Some foods do not fit neatly into given categories. Some discussion may be necessary to come to terms with what is meant by a processed food. For example, baked beans, if prepared at home from primary products would be classified as a secondary food product; when bought in a can off a store shelf, baked beans are regarded as a tertiary food product.

CLASSIFYING OF MANUFACTURED FOODS

Generic Food	Primary Food Product	Secondary Food Product	Tertiary Food Product
Potato Chips			✓
Cornflakes		✓	
Mushroom Soup			✓
TV Dinner			✓
Chicken Coating		✓	
Bacon		✓	
Baby Biscuits			✓
Baked Beans			✓
Stew			✓

Section 3: Activity 4

1. Explain to the student that farmers must prepare business plans (plans of action) to apply for bank loans. The steps of production to the point of sale must be listed. Have the student use steps similar to the flow chart found in Section 2: Activity 2.

Answers may vary slightly from the following plan:

- Purchase seed.
- Pay for fuel and the use of machinery to plant the seed.
- Purchase fertilizer and pay for the machine cost to spread the fertilizer.
- Purchase herbicide and insecticide.
- Pay for the cost of machinery and labour to spray herbicide and insecticide.
- Hire people to assist with the harvest. (Harvesting is labour-intensive.)
- Pay for the cost of transportation from the field to the processing plant.
- Provide water for washing, plus knives and tools for trimming onions.
- Hire people for processing.
- Pay labelling or price-tagging costs.
- Purchase twist-ties and shipping boxes.
- Pay for transportation to deliver the onions.
- Pay overhead costs such as the following:
 - heating water for washing
 - air conditioning at the processing plant
 - electricity for lights and motors
 - refrigeration
 - taxes
 - depreciation on buildings
 - interest on operation loans
 - service charges for banking cheques from sales
 - profits taken by the owner

2. There are many answers for this exercise. Ensure that each of the ten answers has three parts:
 - a. a descriptive sentence naming the product and the cereal grain it contains
 - b. a sentence describing the product's box or package
 - c. a sentence describing an attraction on the package of each product, and to whom the attraction is addressed, such as to men, women, children, or senior citizens

Section 3: Activity 5

1. The inherent energy comes from the sun.
2. Answers include the following:
 - Oil – fuel, heat, herbicides, pesticides
 - Coal – heat and power
 - Natural gas – heat, power, cooking, fertilizer
3. Oil and natural gas are the sources of non-renewable energy that people most depend on.
4. and 5. Ensure that students' answers are reasonable interpretations of the Agriculture and Food System chart.

For question 4., the energy inputs or energy investments that are needed for the production of food at the farm level would refer to those items in the chart with arrows pointing towards the farm. Such items as farm machinery, fertilizers, electricity, and petroleum products would be needed. In turn, each of these would have associated input costs. For example, in order to produce farm machinery there would be costs in terms of such things as metalworking and mining costs.

For question 5., the expenditures involving energy inputs beyond the farm level would refer to items in the chart where the arrows are pointing away from the farm. These would include costs associated with processing, packaging, transporting, and distributing of food.

6. This exercise requires students to apply their knowledge of the concepts of processing, packaging, transportation and storage, and marketing to an example listing of energy inputs for a food refinement. There is not a specific list of answers, but examples follow to assist you in guiding the students.

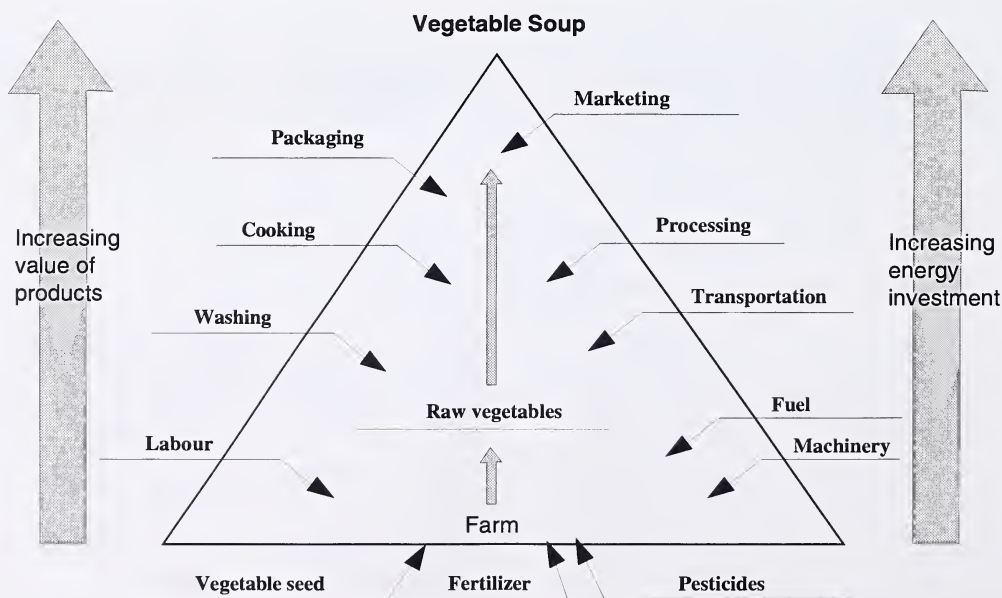
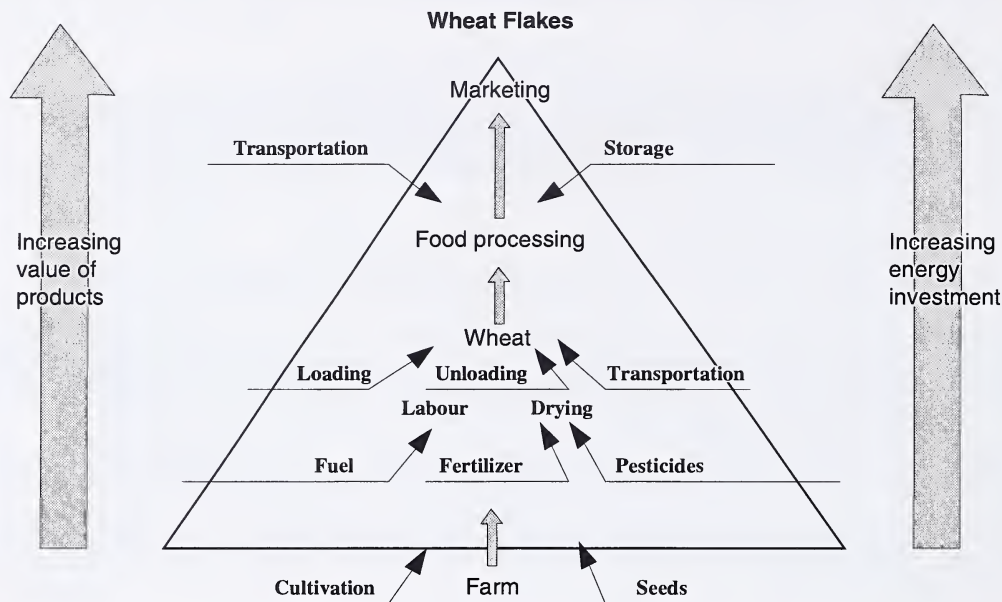
ENERGY INPUTS

Processing	Packaging	Transport and Storage	Marketing
washing vegetables	production of paper	purchase of gasoline	store lighting
cutting of vegetables	making of labels	purchase of machinery	heating store
purchasing ingredients	printing of labels	labour to operate	labour
mixing ingredients	putting labels on cans	insurance: fire and liability	advertising
lab testing of stew	producing boxes	taxes	purchase of equipment
storing vegetables	filling boxes with cans	utilities for warehouse	interest on loan
butchering animals	palletizing boxes	purchase of building	banking charges
cooking products	warehousing boxes	interest on operating loan	loss to shoplifters
adding additives	rotating stock	repair of machinery	maintaining parking
canning	inventory and records	records and inventory	purchase store

Section 3: Activity 6

Food pyramids illustrate the fact that foods can be processed and refined to a level where numerous energy inputs or expenditures are necessary to produce them. As energy inputs are added the investment in the end product increases and the value of that product is high.

Possible answers for the two food pyramids follow, but any reasonable energy input submitted is correct.



Section 3: Follow-up Activities

Extra Help

If help is needed, assist students to cook as instructed.

Enrichment

Have students read the stories from the Appendix, Section 3: Enrichment.

1. Growing lentils may prove profitable because of the following reasons:

- Lentils fix nitrogen in the soil.
- Lentils provide a protein-rich pig feed supplement.
- Lentils might provide seed for a contract crop.

2. The farmers' equipment was inadequate for the following reasons:

- The runs in the drill had to be plugged.
- A bulk-fertilizer spreader had to be rented.
- The swather was not suitable for a short crop.
- A swath turner had to be rented.
- A seed cleaner had to be hired.
- A mixer mill had to be hired.

3. Unexpected costs included the following:

- A special, expensive weed spray was needed.
- Special clothing was needed to use the weed spray.

4. Conditions that helped cause the crop failure included the following:

- Weed infestation affected seed germination.
- There was winterkill.
- Weed seeds had to be cleaned from the harvested crop.

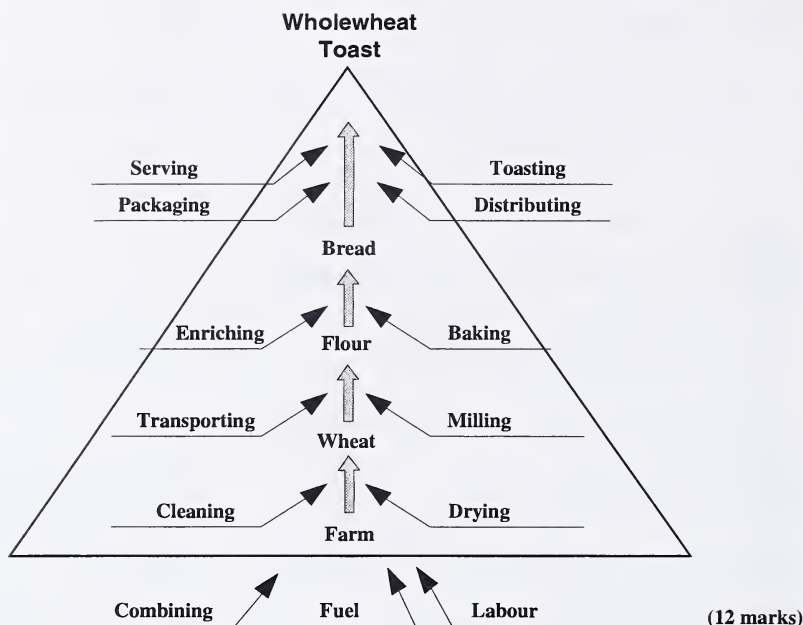
5. To save input costs, Fred and Maria did the following:

- They used a former machine shed.
- They built the pens.
- They cleaned the pig pens by hand.
- They insulated the barn with bales.
- They fed whey to cut feed costs.

Note: The student should now read the Conclusion for this section and complete the Section 3 Assignment in the Assignment Booklet; then, read the Module Summary for Module 1.

Section 3: Assignment Answer Key (35 marks)

1. Possible answers for the energy pyramid for a flake of bran from the time it leaves the field to the time it becomes wholewheat toast follow. Allow two marks for the pyramid drawing and one mark each for valid energy inputs at various stages of processing, to a maximum of ten marks.



2. As energy is added the value of the food increases. This is partly due to the cost of the energy that was invested to produce the final product. **(4 marks)**
3. White flour is enriched to replace vitamin B and add iron. Milling also makes cereal grains more digestible. However, the inherent energy value of the grain does not change. **(4 marks)**
4. a. It is expected that the student will create a unique advertisement. Check for the effectiveness of the advertisement in providing factual information, for including items on how processing involving a field crop has produced a superior product, and for advertising techniques used to promote the product. **(5 marks)**
- b. The list of features and the reasons students give for using those features will vary. Sample answers of features students might use include:
 - overall size of the advertisement
 - use of lettering size
 - use of lettering colour
 - spacing of words
 - inclusion of a printed text
 - inclusion of pictures or illustrations
 - spacing of the illustration
 - amount of information
 - displaying the price
 - use of a "lost leader," give-away, or coupon
 - coloured advertisements versus black and white
 - use of a famous face
 - use of a testimonial
 - use of a theme
 - a psychological suggestion, such as humour
 - use of catch words or phrases
 - an appeal to nutritional needs

The advertisement may also appeal to preferences for

- taste
- smell
- appearance
- convenience
- ease of storage
- lack of waste

Check to see that each feature listed by the student has an appropriate explanation as to why it was used. At least some explanations should mention how processing was involved in producing a superior product. **(10 marks)**

Note: A final grading for Module 1 can be determined at this point.

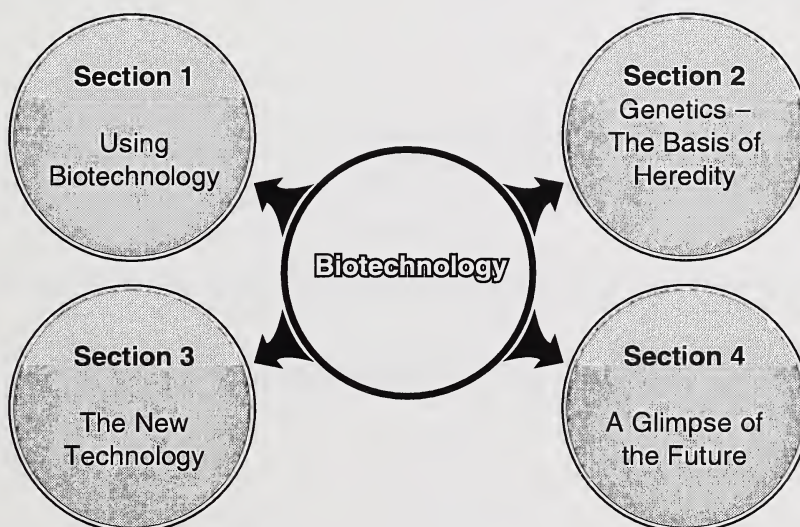
Module 2: Biotechnology

Overview

Biotechnology is the use of biological processes in living things to provide people with goods and services. One goal of biotechnology is the production of healthier, more efficient organisms. This unit examines the application of biotechnology to the development of such things as improved plants, better animals, and more efficient industrial processes with an emphasis on large animal production.

In this module students will

- investigate how people use living things to provide goods and services
- learn how different breeds are suited for different functions
- examine the characteristics of various farm livestock breeds
- learn the basic principles of heredity and animal breeding
- examine some of the hormones that regulate life processes in livestock
- learn about the methods of genetic engineering that may play an important part in their futures



Evaluation

The student's mark in this module will be determined by his or her work in the Assignment Booklet, which contains four section assignments. The mark distribution is as follows:

Section 1 Assignment	20 marks
Section 2 Assignment	30 marks
Section 3 Assignment	20 marks
Section 4 Assignment	<u>30 marks</u>
TOTAL	100 marks

Videos

The following VHS video programs are suggested if the students are to use the optional media learning pathways in Module 2.

Alberta Horse Breeds for the World (Alberta Agriculture), 20 min.

Form to Function: The Importance of Conformation (Alberta Agriculture), 11 min.

Improving the Odds (Alberta Agriculture), 28 min.

Beef Seed Stock (Alberta Agriculture), 10 min.

These videos may be available from your regional library service or media centre, Learning Resources Distributing Centre, ACCESS Network, or your regional agriculture office.

Note: If the video resources are not available, students will still be able to complete the activities by following the print pathways in the module booklet.

Section 1: Using Biotechnology

Key Concepts

In this section students will

- discover how people use living things to provide goods and services
- understand how this is important for health and well-being
- learn biotechnology's role in the raising of plants and animals and the processing of food

Section 1: Activity 1

1. and 2. Students are to check their answers with the sample answers given in the Appendix in the module booklet. Answers may vary. Other answers may be discussed with the learning facilitator. If so, check to see if the answers are suitable.

3.

Problem	Cure (a., b., or c.)
insect damage to fruit	a
low carcass weight	c
poor germination	c
small eggs from a chicken	b
disagreeable temperament in an animal	c
loss of crop to short growing season	c
slow weight gain	c
poor mothering instincts	c
infertile cows	c
slow maturation	c
milk with low butter fat content	b
low resistance to diseases	b

Section 1: Activity 2

- 1.–3. Students are to check their answers with the answers given in the Appendix in the module booklet.
4.
 - a. Answers will vary. The evidence suggests that this method is safe.
 - b. Further study and publishing the results should reduce consumer anxiety.
5. Milk producers require a quota to sell milk. The ability to produce more milk will require them to purchase a large quota – this may be quite expensive if it is possible. It is also possible that fewer farms will be required to meet the demand.
6. Steroids are banned for the reason of unfair competition, just as they are for human sporting events.
7. Steroids should not be used in meat animals, because they can be found in parts of the animals that are used for food. These chemicals are also active in humans.

Section 1: Follow-up Activities

Extra Help

biology – the study and classification of living things

botany – the study of plants and plant life

chemistry – studies the composition of substances and how these substances are produced or converted to other substances

biochemistry – deals with the substances involved in the life processes of plants and animals

genetics – the study of heredity and variation in plants and animals

zoology – the study of animals and animal life

ecology – deals with the relationships between living things and their environments

entomology – the study of insects

bacteriology – the study of bacteria and their relations to medicine, industry, and agriculture

Enrichment

1. The effects on this one food-processing industry if cheese is ripened faster include the following:
 - less expensive product
 - more competitive industry
 - more product available
2. The following factors will determine if hormones are to be used on food crops:
 - benefits to growers
 - benefits to consumers
 - the absence of any harmful side effects

Note: The student should now read the Conclusion for this section and complete the Section 1 Assignment in the Assignment Booklet.

Section 1: Assignment Answer Key (20 marks)

1. Answers will vary. The following are possible responses.
 - a. A breed of cattle for milk production: Holsteins are the best milk producers. Other breeds include Guernsey, Ayrshire, Brown Swiss, and Jersey. The amount of milk production and butterfat content are the important characteristics of these animals. **(1 mark)**
 - b. A breed of cattle for beef products (meat): Beef cattle must be efficient feed converters and good mothers. Common breeds include Hereford, Charolais, Simmental, and Aberdeen Angus. **(1 mark)**

- c. A type of swine raised in confinement: Lacombe, Landrace, and Yorkshire are common in Alberta. Hogs are efficient converters of cereal grains and legumes into meat. **(1 mark)**
- d. A type of swine raised outdoors: Because of the climate, few hogs are raised outdoors in Alberta. Hogs raised outdoors are usually larger and have better grazing abilities than those raised indoors. Crossbred hogs are more common outdoors – these include Landrace and Yorkshire hogs, as well as Chester White, Berkshire, and Duroc. **(1 mark)**
- e. A breed of sheep for wool: Fine wool breeds (e.g., Marino) produce large amounts of wool in very fine fibres. **(1 mark)**
- f. A breed of sheep for meat production: Suffolk, Hampshire, and Dorset sheep are bred for their lambing abilities. **(1 mark)**
- g. A breed of poultry (laying hens) for egg production: Leghorn and Rhode Island Red chickens each lay about 280 eggs per year compared with 100 for non-laying chickens. **(1 mark)**
- h. A breed of poultry (broiler chicken) for meat: Cornish, White Plymouth Rock, and Hubbard are fast-growing and well-muscled chickens. **(1 mark)**
2. Award one mark for each point. The following are suggested answers.
- | | |
|---|---|
| a. increasing fertility of females | d. shortening gestation periods |
| <ul style="list-style-type: none"> • saves time; no waiting for the next cycle to start • herd management easier • saves money (1 mark) | <ul style="list-style-type: none"> • more rapid calf production (1 mark) |
| b. increasing resistance to disease | e. sizing calves for easier birth |
| <ul style="list-style-type: none"> • poor growth in sick animals would be overcome • using antibiotics in meat animals not allowed • reduces veterinary expenses (1 mark) | <ul style="list-style-type: none"> • fewer calf losses • less management required (1 mark) |
| c. reducing fat and increasing protein in milk and meat | |
| <ul style="list-style-type: none"> • healthier foods • a product that meets consumer demands (1 mark) | |
3. Answers should include at least two of the following general areas and a discussion of each:
- | | |
|------------------|--------------------------------------|
| • animal welfare | • producer benefits |
| • human safety | • adequate testing |
| • regulation | • public acceptance (7 marks) |

Section 2: Genetics – The Basis of Heredity

Key Concepts

In this section students will

- identify the characteristics that indicate a quality animal such as a Thoroughbred horse
- learn how these characteristics are passed from parents to their offspring in beef cattle
- consider the benefits and risks of using specialized breeds while selecting a breeding program

Section 2: Activity 1

- 1.–3. Students are to check their answers with the answers given in the Appendix in the module booklet. If students had other answers they may discuss them with the learning facilitator. Check to see if the answers are suitable.

Section 2: Activity 2

- Wild animals that might be related to the following domestic animals include
 - cattle: water buffalo, wildebeast
 - horses: zebra
 - chickens: grouse, partridge
 - pigs: wild boar
 - dogs: wolf
- Answers will vary. Characteristics suggested should include such things as eye colour, hair colour, plus special features such as nose shape or general appearance.
- Answers will vary, but may include such things as suntans, physical condition, and artificial hair colour.
- The factors for the white flowers were provided by recessive factors from the F_1 parents.
- Answers will vary but they should be close to 30.
 - Answers will vary but they should be close to 10.
 - Answers will vary but should be close to 25% or one chance in four.
 - Answers will vary but should be close to 75%.
- The fact that each parent contributes only one chromosome for each pair of chromosomes keeps the number of chromosomes in an embryo the same as the number in the parents. If not for this, the number of chromosomes and genes in each offspring would double every generation.

Section 2: Activity 3

- Recessive genes are difficult to eliminate because these genes are only expressed in a phenotype when two recessive genes are present.
- Eight animals had crossed eyes (cc); all animals having the cc genes should be eliminated.
 - Only eight animals have two genes for normal eyes (NN). The rancher cannot recognize these animals, because they will look the same as the animals with one recessive gene (Nc) for crossed eyes.
 - Sixteen animals contain one recessive gene for crossed eyes (Nc).
- Strengths would be closely linked to weaknesses – you would be culling favourable traits at the same time.
- The two factors that are most important to the success of a crossbreeding program are
 - breed selection
 - the use of unrelated breeding stock
- Rapid weight gain and high carcass yields are important traits in a cow-calf operation because they increase the value of the calves to be sold. These traits also reduce the time required to produce a marketable animal. These traits will come from the bull.
- Cows must be able to pass on good mothering ability and effective milk production. Mothering ability is important to increase the survival rate of calves in both replacement and terminal herds.

Section 2: Follow-up Activities

Extra Help

Students are to check their answers to the crossword puzzle with the answers given in the Appendix in the module booklet.

Enrichment

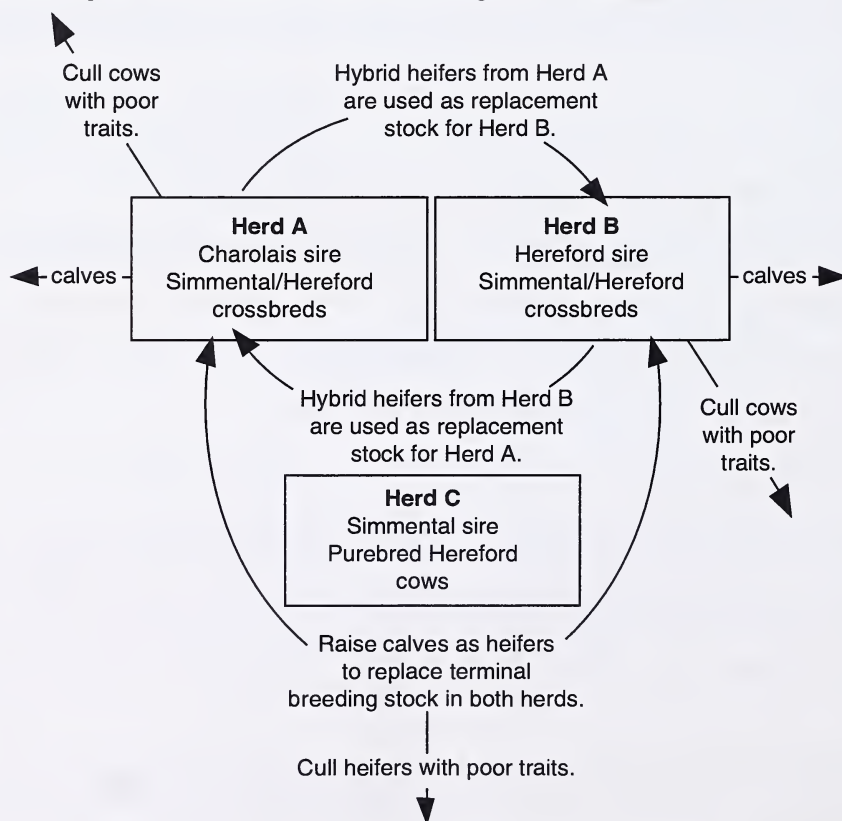
1. a. Bulls are a source of new genetic material that is used to introduce new characteristics and hybrid vigour to a herd.
- b. Factors that might determine the price a bull sells for at a bull sale include desirable traits held by a particular animal, demand for qualities of that particular animal and breed, and popularity of that particular breed.
2. a. and b. Be sure to discuss your student's trip to the racetrack or horse show and the horses that were seen at the track or show.

Features of good and poor conformation were discussed in Section 2, Activity 1. Features of good conformation might include carrying its head high, being alert, having a long straight neck and long body, and having strong muscle development in its front and hind quarters. Features of poor conformation might include bowed-out or turned legs, too steep or too flat pastern angle, a short neck, a large head, or in general, being poorly proportioned.

Note: The student should now complete the assignment for Section 2 in the Module 2 Assignment Booklet.

Section 2: Assignment Answer Key (30 marks)

1. Answers will vary. Ideas learned in Section 2 regarding conformation can be applied to any animal of student's choice. Each breed of animal will have certain quality characteristics that are important to that particular breed. Due to straight breeding in order to preserve strong breed characteristics, weaknesses for other traits may be inherited at the same time, resulting in the health and vigour of a purebred strain to decrease over time. Be sure students have answered the points asked for in the assignment. **(10 marks)**
2. a. The following is only one possible solution to this question. Answers may differ from the one illustrated in the graphic. Students may opt for a composite herd where bulls are rotated to ensure a good mix. **(10 marks)**



b. Answers will vary depending on the crosses and plan chosen, but they should include

- cows with good mothering abilities
- a terminal herd that produces hardy calves with a rapid growth rate and a potential for high carcass yield **(5 marks)**

3. a. Breed weaknesses are usually the result of recessive genes. Inbreeding results in the pairing of genes and an expression of weakness in the phenotype. **(3 marks)**

b. Importing an unrelated bull with different genetics (outbreeding) or using a bull of a different breed (crossbreeding) can result in the trait being repressed by dominant genes of another type. **(2 marks)**

Section 3: The New Technology

Key Concepts

In this section students will

- learn about the reproductive process in animals
- see how humans can intervene in this process to serve special needs
- discover the methods used by genetic engineers

Section 3: Activity 1

1. The brain is the control centre. In some animals the brain prevents the release of hormones until conditions are such that survival of the offspring is assured. Factors such as climate, inadequate food, and a stressful environment can prevent the start of a breeding cycle. (Domestic animals are less influenced by their environment.)

2. The events that are started or stopped by different hormones include the following:

- The start of the estrus cycle is initiated by gonadotropin.
- The release of the egg is controlled by hormones released by the pituitary gland.
- The enlargement of the ovary is stimulated by estrogen.
- The start of mating behaviours is stimulated by estrogen.
- The contraction of the uterus (hormone not mentioned) is stimulated by a hormone produced as a result of mating with sire.
- Preparing of the uterus to receive the embryo is helped by progesterone.
- Stopping the estrus cycle is controlled by progesterone.

3. Possible problems that may result in poor performance by a bull or stallion include

- the wrong season
- stress
- poor health
- poor quality sperm or a low sperm count
- a low sex drive

4. After sixteen days the fetus in a mare becomes attached to the wall of the uterus.

5. After thirty-five days most of the organs, including the brain and the heart, are present and the embryo is now called a fetus.

6. a. 124 hours: Continued cell division results in a large number of cells that group together in a regular arrangement for the first time.

b. 35 days: Different types of cells are formed that group together as tissues and organs.

c. 340 days: A skeleton is developed. Tissues and organs mature and take over life functions.

Section 3: Activity 2

1. a.–c. Students are to check their answers with the answers given in the Appendix in the module booklet.
2. Males and females still supply the reproductive cells and genes. However, the process of fertilization has been taken over by technology.
3. The benefits of this approach to reproduction include
 - The number of eggs has been increased by superovulation. This increases the number of animals that can be produced with the genetic characteristics of the parents.
 - Using a surrogate mother in another country gives the calf immunity against local diseases.
 - Transporting cattle as embryos is very inexpensive.
4. It makes for less involvement with the animal, and simplifies the operations required to complete the transfer.
5. These animals would be used as a control in this experiment. The effects of genetics could be eliminated. Any differences in weight gain would be the result of feed quality, and not characteristics of the animal.

Section 3: Activity 3

1. and 2. Students are to check their answers with the answers given in the Appendix in the module booklet.
3. Answers will vary. Cloned animals would make excellent research animals, because they could breed naturally in multiple herds to quickly produce quality animals. Cloning could provide a source of highly reliable genetics for crossbreeding programs.
4. Answers will vary but might include the following:

<ul style="list-style-type: none"> • more efficient users of feed • faster maturation • easier births 	<ul style="list-style-type: none"> • greater fertility • a resistance to disease and infection • special colour or physical characteristics
--	--
5. Drawings of students' "geeps" will vary. The advantages and disadvantages of the "geeps" will also vary, but should be plausible.

Section 3: Follow-up Activities

Extra Help

Students are to check their answers with the answers given in the Appendix in the module booklet.

Enrichment

1. Be sure to examine and discuss student plans. Has the student managed to invent plants with special abilities?
2. Be sure to examine and discuss student plans. Has the student managed to combine some unusual traits into a functional animal with special abilities?

Note: The student should now complete the assignment for Section 3 in the Module 2 Assignment Booklet.

Section 3: Assignment Answer Key (20 marks)

1. a., b., and c. Answers will vary. Check for several characteristics and a description of how these characteristics will make the animals suited to their new purpose. **(6 marks)**
2. Answers will vary. They may include a description of artificial insemination, embryo transplants, gene transplants, or recombinant DNA. The creation of multiple animals with identical genes may be produced by embryo splitting or cloning. **(10 marks)**

3. Drawings will vary. Students may select some unusual combinations. Although this type of genetic engineering has worked best on related animals, the focus of this activity is on improving function and inventive technology. Approve any selections that result in a unique animal or an unusual purpose. **(4 marks)**

Section 4: A Glimpse of the Future

Key Concepts

In this section students will

- examine how genetic engineering can be used to improve animal health, production efficiency, employment opportunities, and the economy
- consider the improvements that can result from biotechnology
- see how research and biotechnology is used in Alberta
- discover some of the issues created by the use of biotechnology

Section 4: Activity 1

1. Answers will vary. The possibilities are endless.
2. Three important benefits that resulted from the introduction of Marquis wheat were
 - more successful wheat farming
 - increased food production
 - a better income for farmers
3. Research can increase the success of Alberta's farmers through
 - better products
 - higher productivity
 - better earnings
4. Improved livestock can result in higher incomes for producers because of
 - better products
 - better feed conversion to animal protein
 - new products to sell
 - new markets for products

Section 4: Activity 2

1. Answers will vary, but consideration should be given to the following observations.
 - a. Should experimental breeding be indiscriminate? Some types of "improvement" do not consider animals to be living things. The limits of biotechnology must also include humane treatment for the animals that serve people.
 - b. This is not an improvement. A different cross should be used. The cow would only be able to deliver one or two calves and the veterinary bills would be high.
 - c. The welfare of the animal must also be considered. This is acceptable if the health of the animals is not placed at risk.
 - d. The factors that produce a winning horse also include training and feeding but genetics is quite important. Artificial insemination is highly regulated for Thoroughbred racehorses to protect the breed's purity. It is difficult to prove the origin of the sperm or embryo without a follow-up blood test on the foal – this opens up the possibility of fraud. There is also some concern that AI or embryo transplant technology will reduce the value of these horses and cause a few select strains to dominate the gene pool.
 - e. The use of these weapons is outlawed by international treaties. The development of this technology is not forbidden. This type of research should be discouraged by the scientific community.
2. Answers will vary but may include the following:
 - safe confinement
 - safe disposal
 - access only for authorized people
 - emergency procedures in case of fires or natural disasters

3.
 - a. This does not represent a unique species, character, or use. It has also been produced by natural processes.
 - b. This unique organism is the result of ingenuity and invention.
 - c. This does not represent a unique species, character, or use.
 - d. This does not represent a unique species, character, or use.
 - e. This unique organism is the result of ingenuity and invention.
 - f. This unique organism is the result of ingenuity and invention.

Section 4: Follow-up Activities

Extra Help

1. Biotechnology has created economic opportunities for Alberta by creating new products, new industries, and new customers.
2. People should come to Alberta to buy their cattle because of the superior genetics, quality support and service, and the technological excellence.
3. New breeds created by ingenuity and invention in Alberta should become the property of the inventor if they are not produced for a company or the government. In these cases the employer would own the patent.

Enrichment

1. The ability of plants to fix nitrogen would save billions of dollars in fertilizer costs. Disease and pest-resistant plants would save pesticide and other chemical costs and produce a cleaner environment.
2.
 - a. Biogas can provide a cheap renewable and non-polluting energy resource on a small scale.
 - b. The main reason biogas technology will have a difficult time being accepted in this country is that Canadians do things on a large scale. A biogas plant will have to fit in the framework of other technologies and systems.

Note: The student should now read the Conclusion and Module Summary; then, complete the Section 4 Assignment.

Section 4: Assignment Answer Key (30 marks)

1. Biotechnology can provide many benefits to the economy through improved products and more efficient farming. The new technology also requires many educated researchers, technologists, and technicians. This means added employment in research, educational institutions, and services. Biotechnology will create new products and new markets for these products. **(8 marks)**
2. The two factors that will determine whether organisms created by biotechnology will be accepted are the benefits to society and a respect for animal welfare. **(4 marks)**
3. Marks should be awarded based on students understanding the concepts, rather than on the details of their invention.
 - a. to d. Answers will vary. **(1 mark each; total = 4 marks)**
 - e. Unique characteristics might include special abilities, physical features, or temperament. **(3 marks)**
 - f. Look for originality and a reasonable explanation of the organism's purpose. **(3 marks)**
 - g. Look for appropriate methods and a comparison with processes in nature. **(4 marks)**
 - h. Answers will vary. Students should appreciate the creative nature of technology in the use of familiar materials in both new and unusual ways. **(4 marks)**

Note: A final grading for Module 2 can be determined at this point.

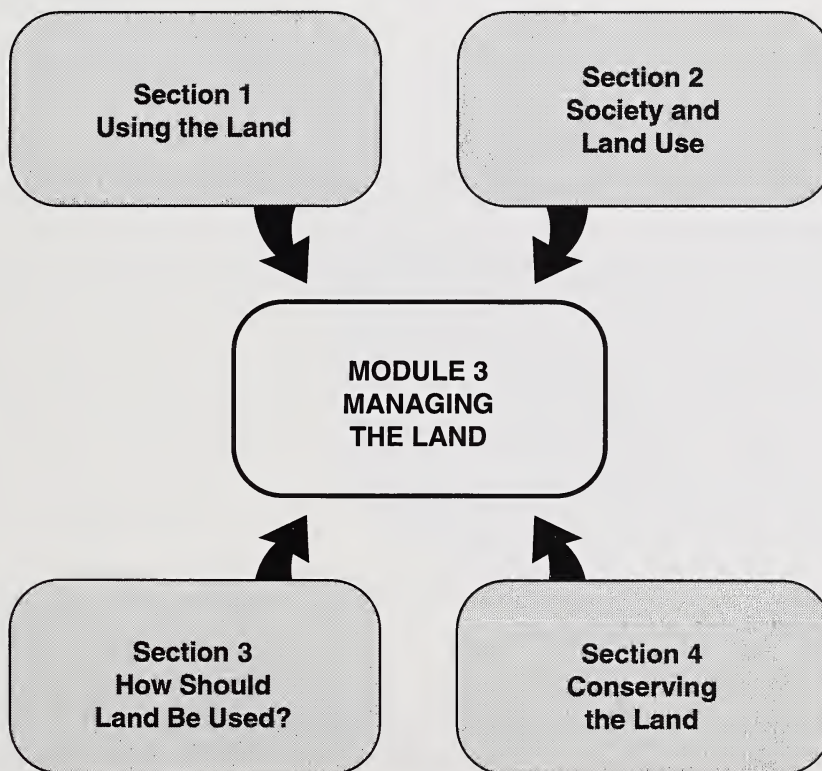
Module 3: Managing the Land

Overview

The land is a source for the resources on which Canadian society and standard of living depend. The use of land for different purposes depends on the physical nature of the land, the resources that it represents, and the needs of society. Suitability of land for agriculture depends on suitable climate, soil, and topography. This module examines the basis for land-use decisions and key issues resulting from land-use conflicts.

Land-use decisions are a matter for public concern. The requirements of food production place increased demands on the land. Agricultural land is being degraded by soil erosion or lost to other uses. Economic pressures are affecting important decisions regarding land use. Solutions to these dilemmas are presented, and alternatives for the future are examined.

In assignments for this module, students will manage the development of an imaginary land area, using a map supplied with the assignment booklet. These assignments are designed to provide practical examples of the considerations and problems encountered by land-use planners. It will also allow students to work with map resources similar to those used by planners to solve these problems.



Evaluation

The student's mark in this module will be determined by his or her work in the Assignment Booklet, which contains four section assignments. The mark distribution is as follows:

Section 1 Assignment	30 marks
Section 2 Assignment	30 marks
Section 3 Assignment	25 marks
Section 4 Assignment	15 marks
TOTAL	100 marks

Materials Needed

Bland, Sue. 1991. *The Living Soil: Land Use and Society*. Edmonton, Alberta: Weigl Educational Publishers Limited.

This module uses many passages and case studies from the textbook *The Living Soil: Land Use and Society*. It will be necessary for students to obtain this book in order to complete activities in this module. References to this text are included for your reference.

Videos

The following VHS video programs are suggested if the students are to use the optional media learning pathways in Module 3.

A Link in the Chain (Alberta Agriculture), 28 min.

This Borrowed Land (National Film Board of Canada), 28 min.

These videos may be available from your regional library service or media centre, Learning Resources Distributing Centre, ACCESS Network, or your regional agriculture office.

Note: If the video resources are not available, students will still be able to complete the activities by following the print pathways in the module booklet.

Section 1: Using the Land

Key Concepts

- identification and classification of land uses
- examination of the history of land use in North America
- evaluation of land for various uses
- planning land use

In this section students will examine the factors that determine how land is to be used. Although the emphasis is on land use for agriculture, urban land requirements are also discussed.

Section 1: Activity 1

This activity investigates how land use has changed and the reasons for these changes.

- Answers will vary depending on the community the student lives in.
 - Answers will vary. Part a. and part b. are included as an eye-opener. There are many uses of land – even in a rural environment.
 - Answers will vary. The list of land uses can be very long because nearly every human activity uses land. See pages 4 to 6 of the textbook, *The Living Soil: Land Use and Society*, for some of the land uses.

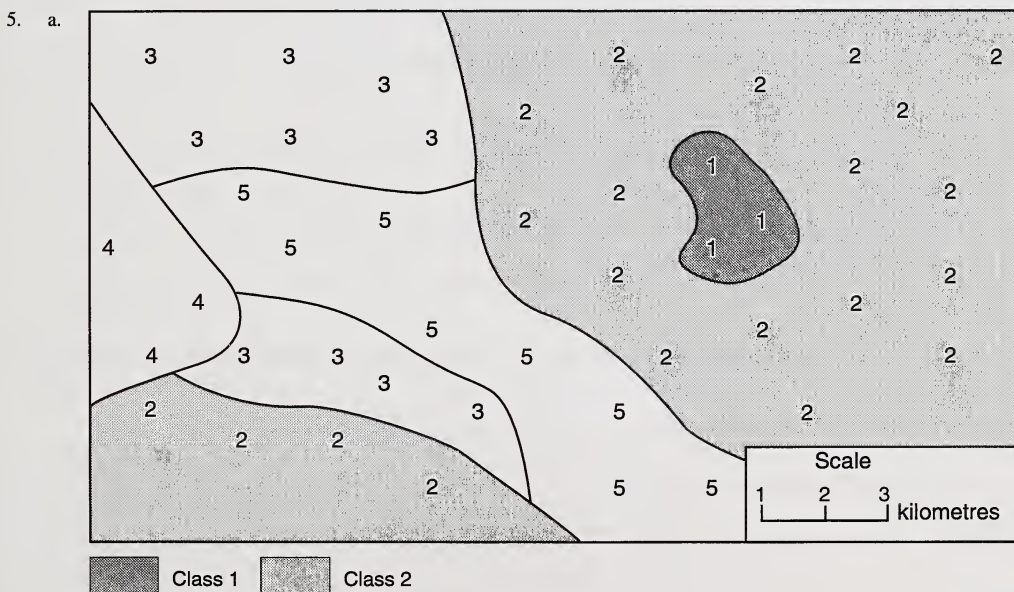
Students can organize their list of land uses under such headings as communities, agriculture, industry, recreation, utilities, mining, transportation, and other. They may find that some uses might fit under more than one heading.

2. a. Native peoples were hunters and gatherers. They depended on wild plants and animals for food.
- b. Their activities had little effect on the landscape. The native peoples depended on the resources of their immediate environment to survive, and they tried to live in harmony with the land.
3. a. Early settlers grew or raised most of their own food. Wild berries and animals in the area supplemented their food needs. Extra produce was traded or sold to obtain other commodities.
- b. The products of modern farms feed many more people. Almost all produce is exported from the farm. Most families, including farm families, purchase much of their food in large supermarkets.
4. Some reasons why land uses change include
 - The population increases.
 - New people move onto the land.
 - Previous land-use practices may be impractical.
 - People recognize new uses.
 - New uses become more important.
 - Advances in technology are made.
 - Transportation systems increase and improve.

Section 1: Activity 2

This activity looks at the natural conditions that limit the use of land for a purpose such as agriculture.

- 1.–4. Students are to check their own answers to questions 1–4 by referring to the Appendix in the Student Module Booklet.



Area 1 numbers, which represent Class 1 agricultural land, should be coloured a different colour from the Area 2 numbers which represent Class 2 agricultural land.

- b. This map could identify areas that are best suited for farming.

6. a. Farms are found on the flat areas between the hilly terrain.
- b. The flat areas may be the bottoms of lakes which formed while the glacier was melting, or later. The soil has developed on clays and silts that formed the bottom of the lake. The flatness of the ground makes for easy cultivation.
- c. The hummocky terrain is difficult to cultivate. The quality of the soil is probably not as good or as consistent as the surrounding area. The large number of “pot hole” sloughs could make this a good breeding area for waterfowl.
- If the student suggests grazing as a potential use, point out that it may be a marginal use due to lack of good grasses or a soil which has higher than normal salinity.
7. a. The gullies on the east side of the river valley may have been formed and widened by wind erosion.
- b. The gullies formed on the west side of the river are the result of water erosion as water runs off downslope towards the river. The soil on the west side is somewhat protected by grass cover and the sides of the valley are sheltered from the wind by the river banks.
- c. Strip farming is done to reduce soil losses due to wind erosion.
- d. The air photo indicates that the prevailing wind blows from the west in this area.
8. a. Yes, the farmland in the area is productive. The regular farms, flat topography, and all the land that is under cultivation indicate agricultural use.
- b. Some of the changes in land use that occurred include
- increased residential use – urban and hectareage (acreage) use
 - new highways
 - new industrial areas
 - urban development – housing, shopping, water treatment facilities, recreation facilities
9. Satellite technology can help people to manage land by
- estimating the hectareage used for certain crops
 - detecting silting of rivers, streams, and lakes
 - determining the effectiveness of controls on soil erosion
 - surveying vegetation
 - determining the condition of land and soil

Any three answers from the preceding list are acceptable.

Section 1: Activity 3

The purpose of this activity is to introduce the idea of an “address” for rural land and to show how the land has been divided for farming and other uses.

- 1–4. Students are to check their own answers to questions 1–4 by referring to the Appendix in the Student Module Booklet.
5. The map locations described by the legal land descriptions are
- | | |
|-------------|--|
| a. Sam Lake | c. Letter F (the second F in REDCLIFF) |
| b. Irvine | d. Seven Persons Creek |

6. The legal land descriptions of the locations shown on the map are

A. Site A: 1 – 72 – 2 – W6

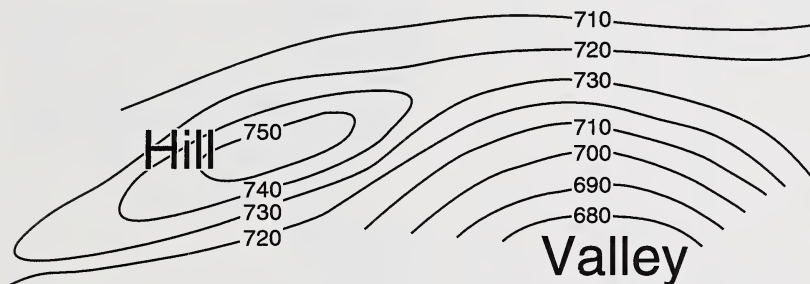
C. Site C: NW1/4 – 3 – 71 – 24 – W5

B. Site B: 30 – 69 – 2 – W6

D. Site D: 32 – 72 – 19 – W5

Note: Some students may notice that the township and section lines between townships 70 and 71 west of the 5th Meridian do not align. This “correction” is necessary every so often as one moves from south to north. The distance between meridians of longitude gets less because they all converge at the North Pole.

7. The contour lines that represent a hill and a valley are shown in the following illustration.



Section 1: Follow-up Activities

Extra Help

Students are to check their own answers to the crossword puzzle by referring to the Appendix in the Student Module Booklet.

Enrichment

Students are encouraged to complete **one** of the following enrichment activities. Students may share their answers with other students or interested adults.

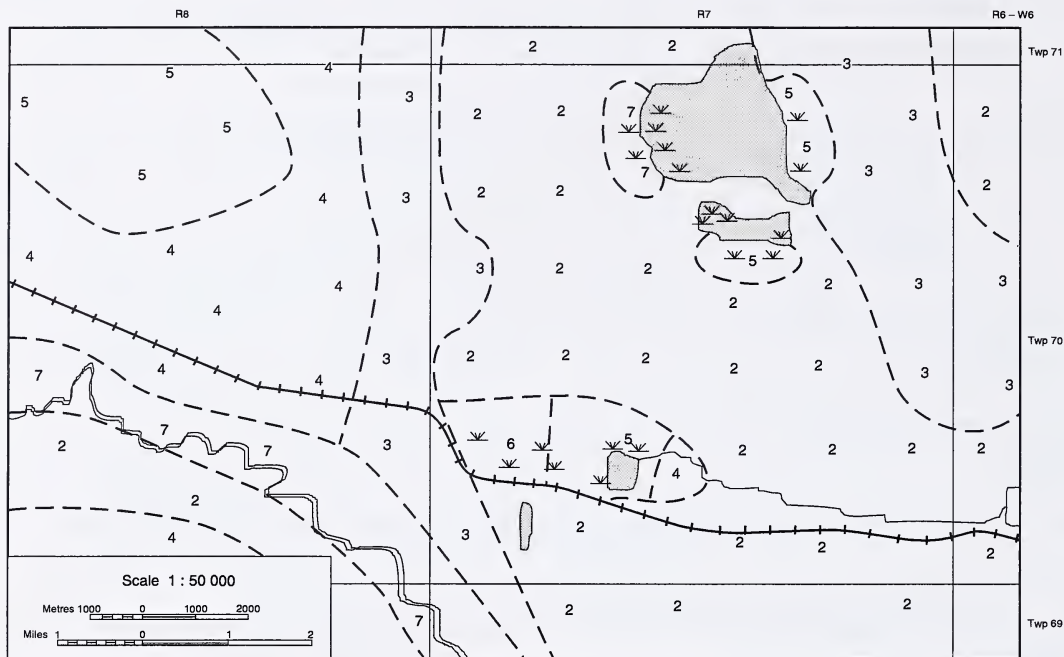
1. Answers will vary. Check to see if the suggested design features were incorporated into the scale plan of the lot.
2. Answers will vary. Check for appropriate arrangement of the farmhouse, other farm buildings, roads, shelterbelts, etc. on the site plan of the farmstead.

Note: Students should now read the conclusion for this section and complete Assignment 1 in their Assignment Booklet.

Section 1: Assignment Answer Key (30 marks)

Be sure to check the Land-Use Plan for appropriate solutions. Answers will vary but should address the requirements as stated in the question. Some of the questions will also require written responses which are to be given in the spaces provided.

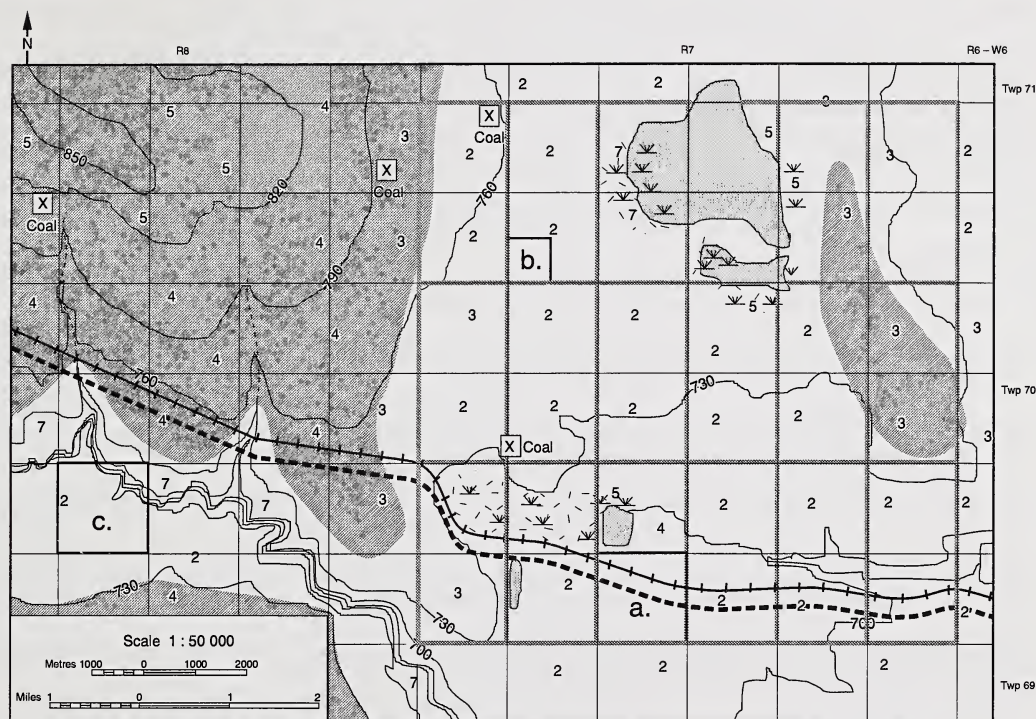
- The map that follows shows how lines would be drawn to form areas containing the same type of soil. Check to see that the colours for each of these areas matches the colour scheme in the student's legend.



(4 marks)

- According to the legend, the Class 2 soils are found in areas of aspen parkland. The vegetation is mainly aspen trees and meadow grasses. The soil below these areas is most likely a chernozemic soil (black, dark grey, brown, or dark brown). This is the best type of soil for farming. (2 marks)
- Class 3 soils are shallower and have lower natural fertility than Class 2 soils. They may also be located on steeper slopes. This increases the amount of management required for cultivation and restricts the choice of crops. (2 marks)
- Luvisolic soils develop below evergreen forests. This soil is acidic and low in nutrients; it is generally poor for farming. (2 marks)
- Organic and poorly drained soils are found in swampy areas. The soils that form in swampy areas may become acidic or saline as the water evaporates. Rocky areas would have shallow, rocky soil. (2 marks)
- Logging, recreation, and marginal farming are three possible uses of evergreen forest areas. (3 marks)
- A hill or hilltops would describe the landform. (1 mark)
 - Steep banks, deep valley, etc. best describe the land along the river. (1 mark)
 - The land generally slopes to the east or south-east. Elevation contours show the slope of the land – they decrease from top left (north-west) to bottom right (south-east). The rivers also drain in that direction. (1 mark)

8. Check the Land-Use Plan. There should be thirty-six sections per township. The map that follows shows the land area divided into sections.



(3 marks)

9. Check the Land-Use Plan for correct plots. The location of the plots are labelled a., b., and c. on the map included for the answer to question 8. These areas should be outlined in red pencil. (3 marks)
10. About thirty sections of Class 2 farmland are ready for settlement. Answers will be slightly different depending on how the land is assessed. (1 mark)
11. Check the Land-Use Plan for a major highway and secondary roads. Roads generally follow alternate section lines and where required for access. (The map for question 8 shows how secondary roads might be located so as to provide access to all quarter sections located in Township 70, Range 7.) The most probable location for the major highway would be along the south side of the railway.) (2 marks)
12. Check the Land-Use Plan. The location of the townsite should be indicated with a symbol of a house. Towns should be located in an area where there is water, where there are major transportation routes, and where there is room for expansion. Swampy land should be avoided. Students may realize that the only land suitable in this area is near the railway, but this land is also classified as farmland. (3 marks)

Section 2: Society and Land Use

Key Concepts

- identifying how land-use conflicts can occur
- seeing how these conflicts can be resolved
- looking at the government's role in managing land use
- debating the conversion of farmland for urban uses
- reporting on a local land-use issue

In this section students will identify how land-use conflicts can occur and look at the social influences on land-use decisions.

Section 2: Activity 1

The purpose of this activity is to examine the role of the stakeholder in land-use decisions.

- Answers will vary. There are six stakeholders to choose from – one for each piece of the pie. Students may choose any three as long as they have valid reasons to support their choices.
 - Answers will vary. There are three groups to be left out. Check to see how valid the reasons are. Are personal biases coming through in the answers?
 - This selection is arbitrary and not controlled by the people involved. A better method would involve agreement among the stakeholders. Two groups may share the same piece of the pie, if their interests are compatible.
- The city of Winnipeg and homeowners were the main stakeholders. The city needed a place to dump its garbage. Homeowners did not want the smells, noise, and rodents associated with a landfill site. Instead, they wanted a park for their neighbourhood.
 - Public meetings were held to give homeowners a chance to voice their concerns. Probably a committee was formed to advise city hall. The project then went ahead by using the same piece of land for both purposes.
- The Alberta Wildlife Foundation, the Alberta government, and other nature groups who wanted to preserve the land as a natural area formed one major stakeholder group. This group became the Wagner Natural Area Society. The other major stakeholder was Alberta Transportation who wanted to extend a service road near the area.
 - Several means to resolve the differences were used.
 - The pro-nature groups sought advice about the best way to protect the area. They formed the Wagner Natural Area Society and were able to obtain a lease for twenty-one years to oppose future development plans to the land.
 - The Society organized local people and environmental groups to lobby and write letters in order to persuade Alberta Transportation to study the long-term impact of their road-building plan.
 - Alberta Transportation and the Wagner Natural Area Society agreed to work closely with each other during the construction to keep environmental damage to a minimum at the new location.

Section 2: Activity 2

The purpose of this activity is to look at how government has helped the process of land-use planning by providing reliable information.

- Uses could include agriculture (ranching, farming), transportation, military, recreation, and wildlife. Student ratings will vary. They should see that criteria used to rate the different uses will also be different. Final land-use decisions will vary.
- The Canada Land Inventory rates how land can be used for agriculture, forestry, outdoor recreation, or as wildlife habitat.

3. The Canada Land Inventory can help people make the best land use in the following ways:
 - prevent misuse of land
 - preserve existing resources on land
 - reduce land-use conflicts
 - make wise decisions by providing information
 - preserve wildlife habitats
4. Much of Canada's land cannot be used for agriculture because it is too cold, too dry, too rocky, too rugged, or has soil that is otherwise unsuitable for farming.
5. Answers may vary. The following sample answers show how stakeholders such as animals and soil are affected by agriculture.
 - Animals – Farming changes the habitat for the animals that are a part of the soil ecosystem.
 - Soil – Nutrients are removed from the soil when crops are harvested. The risk of soil erosion is increased by some farming methods.

Section 2: Activity 3

This activity examines the issue of urban uses of agricultural land.

- 1.–4. Students are to check their own answers to questions 1–4 by referring to the Appendix in the Student Module Booklet.

Section 2: Follow-up Activities

Extra Help

- 1.–4. Students are to check their own answers to questions 1–4 by referring to the Appendix in the Student Module Booklet.

Enrichment

- 1.–2. Students are to check their own answers to questions 1 and 2 by referring to the Appendix in the Student Module Booklet.

Note: Students should now read the conclusion for this section and complete the Section 2 Assignment in the Assignment Booklet.

Section 2: Assignment Answer Key (30 marks)

Be sure to check the Land-Use Plan for appropriate solutions. Answers will vary, but should address the requirements as stated in the question. Some of the questions will also require written responses which are to be given in the spaces provided.

1. Check the Land-Use Plan. The Class 2 sections should be coloured light yellow (for crops). **(1 mark)**
2. Check the Land-Use Plan. The Class 3 farmland should be shaded either light yellow (for crops) or light green (for grazing land). **(1 mark)**
3.
 - a. Check the Land-Use Plan. The Class 4 land should be outlined with a dark green pencil. **(1 mark)**
 - b. Check the Land-Use Plan to see that two sections of the Class 4 land are coloured light green (for grazing land). **(1 mark)**
4.
 - a. Check the Land-Use Plan to see that a highway leads into the Class 4 land. **(1 mark)**
 - b. Check the Land-Use Plan to see that there is a road connecting the agricultural land located south of the river to the highway. The bridge symbol from the legend should be included to indicate that a bridge would be needed to cross the river. **(1 mark)**

5. Check the Land-Use Plan for placement of the water treatment plant, sewage plant, and landfill site. Sample reasons for each of these locations follow:
 - Water treatment plant: close to town for convenience and near source of water
 - Sewage plant: away from town and downstream
 - Landfill site: away from population on poor land **(3 marks)**
6. a. Check the Land-Use Plan for two sections of land designated for recreational use. These should be identified with the symbol of a tree. This land should be chosen because of good access to hiking trails, good fishing or boating potential, good beaches or waterfront areas, or beautiful scenery. Sections along the river or with lake frontage might be chosen. Student reasons for selecting their two sections will vary. Check to see that the reasons for choosing these sections are valid. **(2 marks)**
- b. Check the Land-Use Plan for the three sections of land chosen as wildlife reserve. Two sections of forest land should be identified with a symbol of a deer and one section of wetland with a symbol of a bird. Ungulates need brush cover, aspen, and grass for feed; waterfowl prefer swampy areas close to fields. **(2 marks)**
7. Maps developed by the Canada Land Inventory can help plan land use by helping to
 - determine the best land use
 - resolve conflicts and disputes **(2 marks)**
8. Answers will vary. Check for each of the main points mentioned in the question.

A suggested marking scheme follows:

- a brief statement outlining the issue **(2 marks)**
- a description of the major stakeholders in the dispute **(2 marks)**
- what the stakeholders stand to gain or lose **(3 marks)**
- the methods being used to settle the dispute **(3 marks)**
- the best solution to the issue with supporting reasons (The solution must show an understanding of the issue and a valid attempt at resolving it. The solution will likely reflect some form of agreement among the various stakeholders.) **(5 marks)**

Section 3: How Should Land Be Used?

This section looks at how inappropriate land use can degrade land. Several case studies are examined that present lessons from the past.

Section 3: Activity 1

This activity looks at how past inappropriate land use has degraded the soil and at the lessons that can be learned from these experiences. Some other conflicting ideas are also examined.

- 1.–6. Students are to check their own answers to questions 1–6 by referring to the Appendix in the Student Module Booklet.

Section 3: Activity 2

This activity looks at land use as a power or energy source. This causes frequent conflicts between other users.

1. The land is affected by the following:
 - removal of topsoil during mining
 - flooding of land by dams to provide a source of water for steam production and cooling processes
 - reclaiming of land for other uses after mining
2. An environmental impact study (EIS) examines the need for the project, evaluates other possible land uses, looks at the damage that might result, and proposes ways that the damage may be reduced should the project go ahead.

3.

Power Source	Effect on the Land	Rating as an Effective Power Producer
Coal-fired plants	<ul style="list-style-type: none"> require a great deal of land for surface mining produce large amounts of carbon dioxide, a greenhouse gas 	Good: has worked well in Alberta where you have low sulphur coal
Hydroelectric dams	<ul style="list-style-type: none"> require a great deal of land for reservoirs and large volumes of water 	Poor: Rivers in Alberta generally contain low water levels in the fall and winter; they are slow moving and flat.
Nuclear power plants	<ul style="list-style-type: none"> small amount of land required for plant large amount of land required for holding waste products 	Good: if waste disposal problems could be overcome; danger of accidents causes concern
Wind-powered generators	<ul style="list-style-type: none"> small amount of land required 	Poor: inconsistent winds in most areas
Natural-gas-fired power plants	<ul style="list-style-type: none"> minimal amounts of land required clean burning 	Best: in terms of land and cleanliness, but more expensive than coal
Solar energy	<ul style="list-style-type: none"> land requirements are minimal (can save energy required for heating) 	Poor: presently no effective method of producing electric energy from sunlight

Note: Answers to the ratings above may be different, but they should be justified.

4. Damage to the land and the environment can be minimized in the following ways:

- controlling of emissions
- reclaiming land that has been mined
- locating plants in areas where land is not suited for farming

Section 3: Activity 3

This activity looks at some of the conflicts that may occur over the construction of a dam. The issues which affect such a land-use decision are investigated. Individual students reading “Activity 6” on page 37 of *The Living Soil: Land Use and Society* will be unable to do the questions under “What To Do” and “What Have You Learned?”. If students are working on this course as a class, they may wish to complete all parts of Activity 6 as a class activity under the guidance of a learning facilitator. Answers to Activity 6 are not provided here as they would vary.

In addition to the textbook reading, students may either view a videotape or read a case study, or do both parts if they wish. The first part involves viewing a videotape, *This Borrowed Land*, which presents a variety of land-use issues in a rural context. The second part involves reading a case study to discover some of the risks and benefits of dam construction.

1.

VIDEOTAPE: <i>THIS BORROWED LAND</i>	
Stakeholders	Gains/Losses
Farmers	• lose their land and way of life
Society	• loses valuable land for food production
Government	• (B.C.) hydro gains power to sell
Urban people	• gain industrial jobs that use the power
Foreign landholders	• profit from land sales

CASE STUDY: HYDRO DEVELOPMENT: SOME PROS AND CONS	
Stakeholders	Gains/Losses
Wildlife	• loses habitat – both downstream and upstream
Local people	• gain water access to wilderness areas
Local businesses	• receive economic benefits during construction
Government	• gains power to supply communities or industries
Province	• loses a river as silting fills the reservoir

2. The Canada Land Inventory indicates the best land use.
3. Economics is usually the deciding factor. If the economic benefits are sufficient the project will usually proceed. This may be the short-term view. The decision may also be made to shelve the project based on long-term benefits to other users or a lack of benefits over the long term.

Section 3: Follow-up Activities

Extra Help

Students are to check their own answers to the Extra Help by referring to the Appendix in the Student Module Booklet.

Enrichment

1. a. The tall-grass prairie escaped being developed as a result of both accident and design. Initially this land happened not to be farmed or developed. Later some people tried to preserve this prairie ecosystem in its original state. In the 1970s this land area was officially made into a park by Winnipeg's city council to keep it from development forever.

This particular land in the middle of Winnipeg was rejected as farmland because of shallow bedrock. It was ignored by developers as well for many years. By chance, scientists were looking for an example of the native tall-grass prairie ecosystem. It was established as a reserve after much debate.

- b. Creating and protecting similar land reserves will be important in the future as less land in its original state remains and as less land becomes available for development.

2. a. Answers will vary. Estimates should fall in the range of 25% to 35%.
- b. Answers will vary depending on the estimate that the student gave to question a. Following are two sample answers.
 - If the student estimate was 30% for question a., then the irrigated land will now produce 90% of the total crop produced by the entire area shown before irrigation was introduced, since irrigated land has three times the productivity of non-irrigated land. This compares to the non-irrigated land continuing to produce 70% of the total crop. Thus, the irrigated area shown would produce more total crop than the non-irrigated area.
 - If the student estimate for question a. was 25%, then the irrigated land will now produce 75% of the total crop produced by the entire area shown. This compares to the non-irrigated land continuing to produce 75% of the total crop. Thus, the irrigated land area shown would produce the same total amount of crop as the non-irrigated area shown.

Note: Students should now read the conclusion for this section and complete the Section 3 Assignment in their Assignment Booklet.

Section 3: Assignment Answer Key (25 marks)

Be sure to check the Land-Use Plan for appropriate solutions. Answers will vary but should address the requirements as stated in the question. Some of the questions will also require written responses which are to be given in the spaces provided.

1. Check the Land-Use Plan. Answers will vary. The townsite should be labelled "TS." Poorer land may have been chosen in order to retain good agricultural land for farming; however, swampy land should be avoided. Also, land may not be available because other facilities such as schools, parks, or sewage lagoons may already be located there. **(2 marks)**
2. Check the Land-Use Plan. Answers will vary. The industrial area should be identified with the symbol of a truck. Proximity to town, power, and transportation routes, or poor land for agricultural use are some factors involved in choosing land for an industrial area. **(2 marks)**
3. a. Check the Land-Use Plan. The power station location should be identified with the light bulb symbol. The hydroelectric dam would need to be located on a river, preferably where the valley is narrow to reduce the amount of land that would be flooded; the coal-fired power plant would need to be located near a coal deposit. (One coal deposit is located near a lake; another is located near the river.) **(1 mark)**
 - b. Answers will vary. A coal-fired plant may be preferable because less land would be lost and the mine can be reclaimed. The dam would be better for the atmosphere because less pollution would result. **(3 marks)**
 - c. Conduct an Environmental Impact Study. **(2 marks)**
4. Check the Land-Use Plan. The site should be labelled "SL." Locate the dumpsite on poor quality land away from town. Reclamation of the dumpsite may upgrade the land. **(2 marks)**
5. Check the Land-Use Plan. The airport should be labelled "AP." There may be little choice here; the land must be flat. **(2 marks)**
6. Stakeholders and land-use conflicts may include the following:

<ul style="list-style-type: none"> • Farmers: loss of farmland to other users • Animals: wildlife habitat destroyed by farming/logging • Industry: land for power versus agriculture, recreation, and wildlife • Townspeople: need land for power, services, recreation 	<ul style="list-style-type: none"> • Loggers: wildlife habitat altered • Transportation: land for airport versus farming • Mining: land use for mining versus agriculture, forestry, wildlife, and recreation (8 marks)
---	---
7. Some lessons of the past that can be learned include
 - Land for food production is important to civilization.
 - The soil should be protected from soil erosion and over-use (depletion of nutrients).
 - Inappropriate land use can degrade the land. **(3 marks)**

Section 4: Conserving the Land

Key Concepts

- discovering how you can be responsible for the land
- examining sustained development as a means of managing the land

This section looks at the economic pressures that influence land-use decisions and how land can be managed using a philosophy of sustainable development.

Section 4: Activity 1

This activity looks at the how the land supplies you with a variety of resources. The student will examine sustained development as a way to manage the land.

The student's specific answers to individual questions in this section may vary from the sample answers. However, the concepts expressed should be similar to those given.

1.–7. Students are to check their own answers to questions 1–7 by referring to the Appendix in the Student Module Booklet.

Section 4: Activity 2

This activity looks at the economic factors that affect the way society manages the land.

1. The world marketplace determines the prices of various farm commodities.
2.
 - a. A farmer might grow more of this particular crop if world prices are high.
 - b. A farmer might grow less of this crop when world prices are low. The farmer may change to growing crops having higher world prices, or diversify to other farming pursuits.
 - c. If a government subsidy is given for a particular crop, a farmer may have a tendency to grow more of that crop, or the farmer may realize that growing that crop is a poor long-term risk since subsidies are needed to support it. The farmer may alter the farm operation to take advantage of producing farm products that may be paying higher prices.
3. The farmer can manage the types of machines used, the kinds of crops grown, and the kinds of pesticides, herbicides, and fertilizers used in order to maintain high levels of productivity from the soil.
4. The money from the sale of crops is used to buy the necessary materials. Payments from government (subsidies and incentives) may also be a big factor.
5. When the price falls the farmer has less money to spend on materials.
6. When farm income decreases, the first things to go are often the equipment and chemicals needed to protect the soil while the land is farmed. As a result proper conservation methods are not practised and land becomes more susceptible to erosion.
7. They are reluctant to change because of risk. They would be faced with major capital costs to make changes.
8. Answers may vary. The number of computers being used is growing steadily. Students may cite specific examples of how computers are now being used on farms, or they may state that in 1986, 2.6 percent of the farms used computers and by 1991, 11 percent of the farms used computers.
9.
 - a. Currently twenty percent of farmers are producing eighty percent of the food.
 - b. With technology it is expected that the ratio will change whereby ten percent of the farmers will produce ninety percent of the food.

Section 4: Activity 3

Forestry and agriculture are two major industries in Alberta which require effective land management. The principles of sustained development can apply to these industries.

Students should have enough background information from previous courses in other subject areas as well as from general knowledge to be able to answer questions 1 and 2. However, they may wish to do some research in available reference resources for extra information. Students new to the agriculture course may need to do more research.

1.–4. Students are to check their own answers to questions 1–4 by referring to the Appendix in the Student Module Booklet.

Section 4: Follow-up Activities

Extra Help

Answers to questions 1–6 will vary; what follows are possibilities.

1. A wildlife preserve might be managed by limiting development (urban, industrial, recreational growth) or by protecting wildlife (create wildlife habitats or reserves).
2. Industrial development of an area of Class 1 soil can be managed by limiting the land use to farming or by locating the industries on alternate sites.
3. A stand of prime timber might be managed by encouraging reforestation or by setting annual cutting limits.
4. Surface mining of coal on farmland might be managed by reclaiming land after the coal is mined.
5. To manage a hydroelectric project in a wilderness area, environmental impact studies might be done.
6. To manage soil that is at risk of soil erosion you can use conservation farming methods, keep a cover of vegetation on the soil, or use the land only for controlled grazing.

Enrichment

Students are encouraged to complete **one** of the following activities. Students will check and discuss their answers with the learning facilitator.

1. Answers will vary. Some things that could be included in the drawing are the presence of
 - nesting sites
 - drainage of sloughs and ponds to make one larger permanent wildlife habitat
 - brush or natural plant areas to provide shelter from predators and harsh weather

Note: If students wish to learn more about the work done by conservation groups such as Ducks Unlimited, Buck for Wildlife, Wildlife Habitat Canada, or other similar organizations, they may wish to contact the organizations directly or see if they can get information through their local library.

2. a. The end user will determine the state to which the land should be reclaimed. Land that was previously farmland should be reclaimed to its original state if it will continue to be used as farmland. But there is no use reclaiming farmland if it is to be used as an airport, or flooded by a dam. It is also not fair to expect farmland from land previously used only for wildlife, unless this land was classified as potential farmland.
- b. Answers will vary. The mining company normally pays for reclamation; they are the ones that benefitted from the mined product. In other instances the government and the mining company may pay for reclamation on a shared cost basis.
- c. The government is the only agent that is available to do this kind of work. Guidelines are provided by the Canada Land Inventory – land should be reclaimed to its original state unless another user can be identified.

- d. Answers will vary. Bad publicity due to unregulated mining has affected the image of the industry. Environmentally sound methods can prevent over-regulation by government. Most people do care about the environment.

Note: Students should now read the conclusion for this section, and complete the Section 4 Assignment in their Assignment Booklet; then read the Module Summary for Module 3.

Section 4: Assignment Answer Key (15 marks)

Be sure to check the Land-Use Plan for appropriate solutions. Answers will vary but should address the requirements as stated in the question. Some of the questions will also require written responses which are to be given in the spaces provided.

1. Total forest = 5 townships \times 36 sections = 180 sections
Annual allowable cut = 180 sections/60 years = 3 sections per year

If the forest is to be managed as a renewable resource, three sections of forest can be harvested and replanted each year. **(3 marks)**
2. a. Check the Land-Use Plan. Parts of the Class 2 and 3 farmland that was coloured yellow (for crops) should have wide green lines running from north to south dividing the land into half-sections so as to stop wind erosion from west winds. **(2 marks)**

b. Check the Land-Use Plan. Two sections of Class 2 or Class 3 farmland should have pencil strips running in a north/south direction. This represents strip cropping to stop wind erosion from the west winds. **(2 marks)**
3. Answers will vary. Expect losses of about five sections of Class 2 and Class 3 farmland. (As a percentage, student answers should be in the ten to twenty percent range.) **(2 marks)**
4. Answers may vary. Some of the land may be replaced by reclaiming previous mining areas or industrial sites that are no longer being used, if they were not yet reclaimed. Industries could be relocated to new sites where soil is unsuitable for farming and reclaiming the industrial land for farm use. Also, marginal land could be improved for agriculture. Farmers may move onto the marginal farmland when forests have been cleared, or they may move to reclaimed land sites. **(2 marks)**
5. Prime agricultural land could be protected by restricting the sale or use of the best farmland for purposes other than farming. **(1 mark)**
6. Regulation, incentives, education programs, and research reports are some ways to ensure that logged areas will be reforested. **(3 marks)**

Note: A final grading for Module 3 can be determined at this point.

Module 4: Survey/Projects

Overview

Module 4 is divided into two parts: Part A and Part B.

Part A

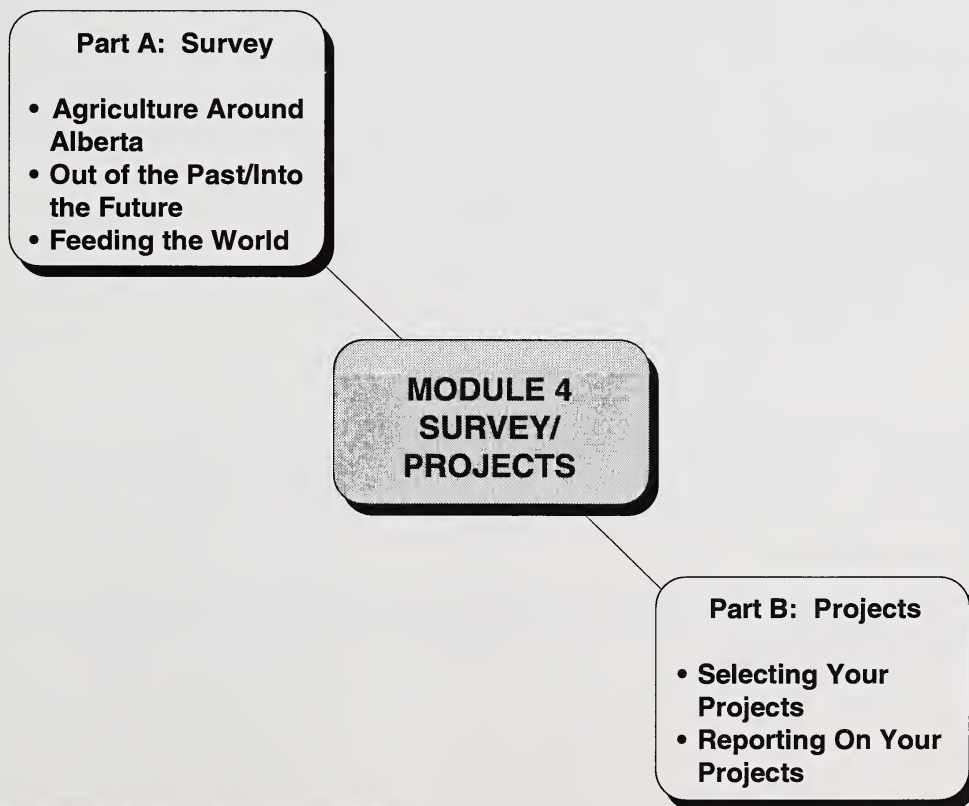
Part A: Survey – What Is Agriculture? is to be done only by those students who entered the Agriculture: Land and Life program at the Year Three level. Students who have previously completed Agriculture: Land and Life/Year One or Year Two must do Part B.

The major task of Part A is to answer the question, What is agriculture? The intent is to provide a comprehensive overview of agricultural activity, thereby providing students with a sense of its diversity and scope.

Part B

Part B: Projects must be completed by students who are taking their second or third year of the agriculture program. If a student has not completed Agriculture: Land and Life/Year One or Agriculture: Land and Life/Year Two, they must do Part A.

Students who have previously completed Year One or Year Two of the Agriculture: Land and Life program now have the opportunity to pursue an interest in particular topics during the Year Three program. They are to complete **two** projects in Part B. Descriptions of the various projects that may be chosen are included under Part B. The assignments for Part B are included as part of the Module 4 Assignment Booklet.



Note: Students are to do Part A or Part B, but not both.

Part A

Part A is to be done after the first three modules of this course have been completed. It draws on many of the key ideas and skills covered in the previous modules to provide a comprehensive overview of agricultural activity, and to develop an awareness of agriculture's scope and diversity. The perspective adopted within Part A is that agricultural activity involves much more than the rural farm – the impact of agriculture pervades all of society. The module examines agriculture at a variety of levels, from local to global, and introduces students to Alberta's role as both an importer and exporter of agricultural commodities.

This is how the sections in this module are organized:

Section 1: Agriculture Around Alberta – Students discover the diversity of agriculture in Alberta and learn why it is so important to all Albertans.

Section 2: Out of the Past/Into the Future – Students travel through time to see how things have changed. Opportunities are present for students to use their imagination to predict how things will be in the future.

Section 3: Feeding the World – Students see how the world food system operates and how it affects them.

Evaluation

In Part A of this module students will be evaluated on how well they answer the question, What is agriculture? The format for the Module 4: Part A assignments is different from that used in previous modules. It is important for both students and learning facilitators to read the Module 4 Assignment Booklet before starting the Student Module Booklet for Part A of Module 4. This will help students decide on the type of presentation they would like to make and determine, with the aid of the learning facilitator, if their presentation choice is possible in their particular circumstances. Once the presentation format has been chosen, students can watch and/or listen for worthwhile items while doing the activities in the Student Module Booklet.

The students' successful completion of all assignments will depend on the experiences obtained while doing the various activities. Many activity choices have been provided so that students have some control over their own learning.

The following distribution of marks is suggested in determining the final mark for Part A of this module.

Section 1 Assignment	30 marks
Section 2 Assignment	25 marks
Section 3 Assignment	25 marks
Final Module Assignment	20 marks
TOTAL	100 marks

Although the value of each module toward the final grading for the Agriculture: Land and Life/Year Three course is the decision of the classroom teacher, it is suggested that Module 4: Part A be worth 25% of the total final grade, based on an equal weighting of the four modules in this course.

Additional Resources

The materials required will depend on the format chosen by students for completing Part A. In order to assist students effectively in their study of this course, it may be helpful to preview Part A. This will give you an idea as to how the topics are developed; it will also give you an overview of the materials needed.

Videos

The following three VHS video programs are suggested if students are to use the optional media learning pathways in Module 4: Part A.

- *Alberta: A Good Place for Agriculture* (Alberta Agriculture), 9 min.
- *Careers in Agriculture* (Alberta Agriculture), 30 min.
- *The Reason Why* (Alberta Agriculture), 27 min.

These videos may be available from your regional library service or media centre, Learning Resources Distributing Centre, ACCESS Network, or your regional agriculture office.

Note: If the video resources are not available, students will still be able to complete the activities by following the print pathways in the module booklet.

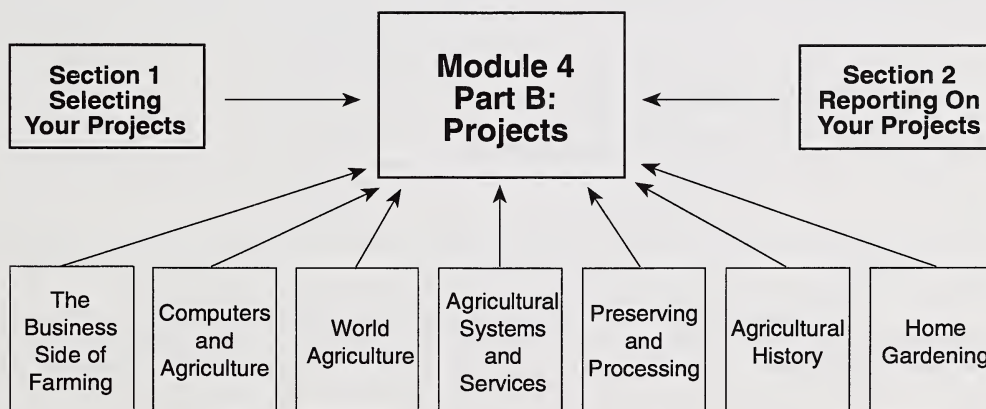
Part B

Part B offers a chance for students to learn more about the areas of agriculture that interest them. This may involve extensions of material covered elsewhere in this course, involve new topics, or focus on local agricultural enterprises.

Students are to choose and complete **two** projects from seven choices that are described.

The projects have several components. Students may emphasize any of the following approaches, depending on their interests and on the availability of time and materials. Their projects may centre around any of the following formats:

- individual assignments
- research reports
- displays
- demonstrations



Note: Students are to select **two** of the seven choices.

Evaluation

In Part B of this module students will be evaluated on how well they complete the assignments for their two projects. Each project is assigned a value of 50 marks. The total value of the assignments for Projects 1 and 2 is 100 marks.

A successful completion of all assignments will depend on the experiences students gained while doing the various activities. Many choices of activities have been provided so students can choose projects in which they are interested. To ensure that student choices of projects and goals can be achieved, students should discuss their project plans with the learning facilitator. Therefore, it is important for both students and learning facilitators to read over the activities in the Module 4 Student Module Booklet, along with the assignments for the projects in Part B of the Module 4 Assignment Booklet.

The following distribution of marks is suggested in determining the final mark for Part B of Module 4.

	Project 1	Project 2
Section 1 Assignment	10 marks	10 marks
Section 2 Assignment	30 marks	30 marks
Final Module Assignment	<u>10 marks</u>	<u>10 marks</u>
TOTAL	50 marks	50 marks

Although the value of each module for the Agriculture: Land and Life/Year Three course is the decision of the classroom teacher, it is suggested that Module 4: Part B be worth 25% of the total final grade, based on an equal weighting of the four modules in this course.

Additional Resources

Materials required will depend on the projects and formats that are chosen. In order to effectively assist students in their choice of projects, it may be helpful to preview the information in Part B of the Module 4 student module, as well as the assignments in Part B of the Module 4 Assignment Booklet. This will give you an idea as to how the topics in the projects are developed, and will provide you with an overview of the materials needed for the various projects.

Part A: Survey – What Is Agriculture?

Section 1 (Part A): Agriculture Around Alberta

Key Concepts

- This section integrates the concepts, information, and experiences from activities and assignments in previous modules.
- Students will discover the diversity of agriculture in Alberta and learn why it is so important to all Albertans.
- The activities and assignments will extend the students' appreciation for the diversity and scope of agricultural activities in Alberta, Canada, and around the globe.

Section 1: Activity 1

Students are to watch the videotape *Alberta: A Good Place for Agriculture* and/or are to look at the map of Alberta located in the Student Module Booklet, and read about the places and the many activities that occur in the province. Some of these are also mentioned in the videotape. They may do both parts of this activity. From watching the videotape and/or looking at the map of Alberta, students are to make notes about the things or places that interest them. As the learning facilitator, you may wish to discuss what agricultural activities occur in the students' locale, and how these activities compare to the diversity and importance of agricultural activities that take place in other parts of the province.

Check to see if the students have made notes about the things or places that interest them. The notes may help them complete the assignments for Module 4: Part A.

Section 1: Activity 2

The following are a few possible captions for the pictures shown.

- Food production begins on the farm.
- Farm equipment for sale – any bids?
- The open range has been replaced by the feedlot.
- Pork is big business in Alberta.
- Modern feeds are not just grown – they are produced.
- Food processing is an industry that depends on farming.
- Processing plays an important role in preparing Alberta's food products.
- Some food is sold directly by farmers.
- Your table is the last step!
- People keep the farm equipment working.
- Animals have to be kept healthy.
- Sheep are raised for wool and mutton.

Section 1: Activity 3

- Check to see that students have completed the table. Answers for this question will vary according to the students' locale. Discuss unusual or unlikely answers with the students. Give praise and recognition to students for identifying locations for the production and processing of food. Many of the answers may be based on the information given on the map for Activity 1, but information from other modules and from other sources could be used as well.

Answers will vary. Possible answers are as follows:

Food	Could Be Produced at	Could Be Processed at
hamburger (beef or pork)	Red Deer	Edmonton
cheese	Bashaw	Bashaw
lettuce	Dunvegan	Dunvegan
tomatoes and cucumbers	Redcliff	Redcliff
buns (wheat)	High River	Calgary
eggs	Devon	Devon
oil (canola)	Sexsmith	Sexsmith
french fries (potatoes)	Spruce Grove	Edmonton
milk	Barrhead	Barrhead
sugar	Taber	Taber

- Answers will vary. Check to see that the answer is appropriate for the students' location and interests.

Section 1: Activity 4

- Answers will vary but should include information on the area's moisture, temperature, and the length of the growing season.
- Discuss answers with students after comparing the students' answers with the information given on the Agroclimatic Map.

The crops used as a basis for this map are grains and oilseeds. Otherwise, answers would vary depending on the type of agriculture being considered. For instance, crops like corn grow better in southern Alberta, while other varieties of market vegetables have different growing-season requirements.

- A lack of moisture is the major climatic factor that limits crop production in southern Alberta.
- Cool temperatures and short growing seasons limit crop production in northern Alberta.

Section 1: Activity 5

1. Answers will vary, but should be similar to the following:

We have adequate moisture in an average year, and at least 100 frost-free days. There are gently rolling hills with some trees (aspens) in the lower areas and along creeks. Crops grown include wheat, barley, and canola.

2. The simplest way to describe soil is by colour. This is by no means a technical description, but it can be a first step toward understanding the distribution of soil types. Most students have seen the rich, black soils that are best for growing crops – many students live in these areas. Darker soils generally form in grassed, moderately moist areas. The dark colour of the soil is caused by the amount of organic matter in it. Grey soils are more common below forested areas. Students may infer soil characteristics, or they may describe the actual colour of soils they have seen.
3. Black, dark brown, some brown (usually with irrigation), and some dark grey soils are used for crop growing.
4. Grey soils and brown soils are generally found in areas used for pasture.

Section 1: Activity 6

Students are to use the graph in the Student Module Booklet to answer questions 1 to 3.

1. The pie graph shows that wheat and coarse grains earn the most money for Alberta farmers.
2. Cattle and calves are the most important source of livestock income for farmers.
3. The important uses of agricultural land are for the production of crops for human and animal consumption and for production of livestock. Note that the largest part of production of livestock is for grazing.
4.
 - Producers are involved in growing and harvesting potatoes.
 - Processors are involved in washing, sorting, cutting, precooking, freezing, and packaging the fries.
 - Marketers would be involved in sales to stores which would then sell the fries to consumers.
 - Suppliers and servicers would be involved in the trucking and transporting of potato products from one stage to the next, storage, and the selling and delivering of needed supplies to producers, processors, and marketers.

Section 1: Follow-up Activities

At this point in the section the activities are normally separated into two strands: Extra Help and Enrichment. Since the activities in this module were designed to integrate the information from the previous modules, no Extra Help activities are included. However, students should be encouraged to do at least one of the Enrichment activities for this section.

Enrichment

1. Reinforce the idea that everyone has a stake in the food and agricultural system – even if only as a consumer. However, agriculture has come to mean a rewarding occupation or career for many people.

Students are to express their findings about an agricultural career in a script format.

If students chose to interview someone involved in agriculture, check to ensure that students asked appropriate questions. You may wish to extend the scope of the interview discussion to determine why the students chose to interview who they did, and if they know other people in the same line of work.

If students show an interest in finding out more about a particular career, or any other farm-related occupation, refer them to other sources of information, such as the local agricultural office or library.

2.
 - a. From the chart, students will see that 1000 t of grain worth \$295 000 becomes bakery products worth \$1.35 million after processing. This is an increase in value of 4.6 times! The \$1 billion worth of grain (1/10 of exports) is now worth \$4.6 billion.
 - b. The increase in value is \$3.6 billion.

$\$3.6 \text{ billion} \times \frac{1}{2} \div \$30\ 000 = 60\ 000 \text{ jobs!}$ A total of 60 000 people would be employed.

- c. The food-processing industry is important to Canada's economy because it employs many people and creates products that can be sold at a higher value than unprocessed products.

Note: Students should now read the Conclusion for this section; then, complete the assignment for Section 1 (Part A) in the Module 4 Assignment Booklet.

Section 1 (Part A): Assignment Answer Key (30 marks)

The assignments for Module 4: Part A give students a chance to practise what they have learned by communicating their understanding to other people. Students will gather or create, classify, and interpret information about agriculture as they assemble items for their presentations.

All items created or gathered should receive marks, with full marks awarded for appropriate materials presented in a proper context, and accurately described.

1. The decision of format is left with the students in consultation with the learning facilitator. More flexibility is possible in a classroom situation. Non-classroom students should choose a format that can be delivered, faxed, or mailed to a central location for marking.

Check to see that students have access to the resources that will enable them to complete the task (for example, a library, videocamera, film camera, farm magazines, advertising materials, photocopies, or art supplies).

Award marks for the outline according to the following guideline:

- overall design: **(4 marks)**
- resource information: **(6 marks)**

2. Answers will vary. At least ten items should be listed or described. The importance of each item to Alberta agriculture should be explained.

- Award one mark for each appropriate selection or creation. **(10 marks)**
- Award one mark for explaining each item and for telling how it is part of the overall picture of agriculture in Alberta. **(10 marks)**

Section 2 (Part A): Out of the Past/Into the Future

Key Concepts

In this section students will

- discover how farmers of the past were similar to farmers of today
- examine changes in agriculture from the past to the present
- examine some of the problems these changes have caused
- discover the reasons behind the growth of the food-processing industry
- make predictions about agriculture in the future

Section 2: Activity 1

Students are to interview a grandparent or someone else who can relate agricultural stories from fifty years ago. Alternately, they could visit a library to read about early life on the farm. In the library students may find personal accounts in sources such as local histories, or in stories and novels about the lives of early pioneers. For example, the Alberta Heritage Series readers, published in 1979 by Alberta Education include the following:

- “The Composite Pioneer,” an essay by Dorothy Kamen-Kaye in *Roads to Yesterday*, pages 166-172.
- “Not a Penny in the World” by Barry Broadfoot in *Western Profiles*, pages 263-267.

Students are then to record their answers to the questions on paper or on audiotape, as if they were interviewing someone from the past. Following are sample answers:

- What did people expect from farm life? What did they see as important for “good living?”

Most people would reply that a good harvest was essential. Other expectations would vary, depending on the type of farm and individual preferences.

- What kind of machinery and technology did they have on the farm?

Answers will vary depending on the type of farm; but compared to current farm machinery, the equipment was smaller (it may have been horse-drawn), less complex, and had few technological features. Many of the tasks now done by farm machinery depended on manual labour.

- How many people were involved at harvest time? Where did they all come from? Where did they go after the harvest?

Seasonal farm workers were common on farms two generations ago. Demands for higher wages, farm mechanization, and increased efficiency have eliminated many of these jobs.

- What was used for power on the farm? Was there electricity? Were there gasoline-powered tractors? Was there natural gas for heat?

Electrical power is now essential to run household appliances and some farm equipment. Not that long ago, the same tasks were performed manually (for example, dusting and sweeping instead of vacuuming or blacksmithing instead of welding). Lighting was provided by candles or coal-oil lamps. Before gas-powered equipment became commonplace on the farm, animals were a main source of power. Heat was usually obtained from burning wood or coal.

- Could farmers get advice from any businesses or other sources to help them? Did farmers get much government help?

Farmers in the past were largely self-sufficient. They became more skilled through trial and error. As farming became more complex, farmers sought help from a variety of sources including governments, banks, dealerships, and training courses. Financial assistance from government to farmers has increased dramatically in recent years.

- How was food preserved to prevent it from spoiling?

Home canning, drying, smoking, and other forms of home preserving were much more common in the past than they are today. Root cellars were often used to store produce such as potatoes, carrots, and turnips.

Section 2: Activity 2

The pictures in this activity show some of the differences between farming in the past and the present. Students are to describe the main differences between each of the four pairs of pictures shown in the Student Module Booklet.

1. Less human time and energy is now required; fewer people are needed to harvest a crop. Mechanical power has replaced much manual labour.
2. Technology has replaced animal and human power – today, a typical homestead has a variety of buildings and specialized equipment.
3. Many kinds of farm animals are now produced within confined shelters. The size of poultry operations and other livestock operations has increased to produce more at a lower cost. Today’s farms feed many more people than did farms of the past.
4. Farming methods have changed. In this case spraying has replaced tillage as a means of controlling weeds. Summerfallowing is becoming less common.

Section 2: Activity 3

- Comments are included with the following answers as to why the suggestions involve conservation or increased crop production methods (or both).
 - Decrease summerfallow.
 - Production will increase because a crop would be produced each year.
 - Conservation because less summerfallow would result in less erosion and in less loss of organic matter.
 - Clear bush to make more farmland.
 - Production will increase because more land is available for farming.
 - Increase the use of chemicals.
 - Production will increase due to increased crop yields.
 - Experiment with higher-yielding crops.
 - Production will increase due to higher crop yields.
 - Practise crop rotation for pest and weed control.
 - Production will increase as crops will be less subject to pest outbreaks.
 - Conservation because the need for chemicals would be reduced.
 - Practise conservation tillage.
 - Conservation because erosion would be reduced.
 - Plant nitrogen-fixing crops called legumes.
 - Production will increase due to increased crop yields.
 - Conservation because less fertilizer would be required.
 - Take marginal land out of grain production and seed it to grass.
 - Conservation because erosion would be reduced.
 - Drain sloughs to increase the available farmland.
 - Production will increase because the amount of farmland would increase and farming operations would become more efficient.
- The answers to question 1 could serve as a guide for this question. Students should answer *Yes*. If people are careful to grow approved varieties of crops, practise crop rotation, use chemicals wisely, and use other proper farming practices, it is possible to increase production and still preserve the Earth's environment and soil.
 - Answers may vary. Ultimately, however, conserving resources and looking after the environment will ensure future production.

Section 2: Activity 4

- The farmer is borrowing money to increase the size of his operation, and to make the farm more efficient. Both are worthwhile objectives. However, as the farm grows, so do costs – the farmer continues to borrow to stay ahead.

The farmer could look at other ways to solve his problems rather than borrowing money, such as cutting expenses and looking for ways (such as growing different crops) to increase income.
- First of all, will the borrower be able to pay the money back? This will only happen if his or her earnings rise faster than expenses after the operation is expanded.

Section 2: Activity 5

Answers will vary. Look for originality, usefulness, and a marketing strategy. The designing of a fictional food is a good chance for students to use their imaginations!

Section 2: Follow-up Activities

At this point in the section the activities are normally separated into two strands: Extra Help and Enrichment. Since the activities in this module were designed to integrate the information from the previous modules, no Extra Help activities are included. However, students should be encouraged to do at least one of the Enrichment activities for this section.

Enrichment

- Answers will vary. A sample calculation of how much a family of four might spend on food each year follows:

\$600/month \times 12 months = \$7 200/year

- b. Answers will vary. Perhaps money would be spent on other necessities such as shelter or clothing, or on entertainment and recreation items.
 - c. Answers will vary. Likely non-necessities, such as entertainment and recreation expenses, would be dropped from a family's budget.
 - d. Answers will vary. However, higher food prices might permit farmers to put more thought and effort toward conservation. Higher prices might also encourage more research, development, and local production of items that must now be imported.
2. Answers will vary. Dryness in the south will mean a greater need for irrigation. Warmer temperatures in the northern part of the province will permit farming if sufficient moisture and suitable soil are available.

Note: The student should now read the Conclusion for this section; then complete the assignment for Section 2 (Part A) in the Module 4 Assignment Booklet.

Section 2 (Part A): Assignment Answer Key (25 marks)

1. Answers will vary. At least three items should be listed.
 - Award one mark (to a maximum of three marks) for each appropriate selection or creation.
 - Award one mark (to a maximum of three marks) for describing the significance of each item to the history of agriculture. (6 marks)
2. Answers will vary. At least two items should be listed.
 - Award one mark (to a maximum of two marks) for each appropriate selection or creation.
 - Award one mark (to a maximum of two marks) for describing the significance of each item to the future of agriculture. (4 marks)
3. Answers will vary. At least five items should be listed.
 - Award one mark (to a maximum of five marks) for each appropriate selection or creation.
 - Award two marks (to a maximum of ten marks) for telling why the resource shown in each item is important to agriculture. (15 marks)

Section 3 (Part A): Feeding the World

Key Concepts

In this section students will see how the world food system operates and how it affects them. They will

- examine a variety of foods, and compare Canadian diets with other countries
- examine international trade in food and food products
- identify issues in world food production and trade
- analyse a problem of food distribution

Section 3: Activity 1

1. Check to see if students have written a description of a meal featuring food from another country. Encourage students to share their food experiences with a friend.
2. Answers will vary depending on what country the recipe is from, as well as what ingredients are used.

Section 3: Activity 2

1. Fruits and nuts are Canada's largest agricultural import group.
2. Canada imports fruits and nuts which do not grow well in this climate, or those which are only available from other countries during Canada's winter season.
3. Many countries can produce these products at a lower cost than Canada. The crops may be fresh and seasonal (such as apples or grapes) and available from the Southern Hemisphere when they are unavailable in Canada.
4. Answers will vary depending upon the foods described for Activity 1. Different countries produce different food ingredients.

Section 3: Activity 3

1. Most of Alberta's agricultural exports went to other countries – \$1.8 billion in 1987; compared to \$1 billion to other provinces.
2. Wheat was Alberta's most important agricultural export.
3. Asia and North America (mainly the United States) were Alberta's most important destinations for agricultural exports.
4. Wheat was Canada's most important agricultural export.
5. North America (mainly the United States) was the leading importer of Canada's agricultural products.
6. In 1987, \$1.8 billion worth of exports were sent from Alberta to other countries, versus \$8.9 billion for Canada. In 1991, the proportion was \$2.5 billion to \$10.1 billion. This indicates that approximately 20% to 25% of Canada's agricultural exports were from Alberta.

Section 3: Activity 4

1. In 1987, Canada had a trade surplus of \$2.1 billion in agricultural products. Canada exported commodities worth \$8.9 billion and imported commodities worth \$6.8 billion.
2. Exports bring money into the country to develop industries and provide wages for workers. Many related businesses also benefit from agricultural exports.
3. An important reason is cost – meat is an expensive food. In poorer regions people eat more staple foods because they are more plentiful and affordable than foods made from animals. Cultural differences and religious beliefs also may play a part.
4. Answers will vary. Some land may be best suited for the raising of crops while other land may not be suitable for raising crops but yet be suited for forage or pasture. Other factors such as weather and climatic conditions, consumer demands for products, and market prices of animals versus grain prices may be mentioned. Check to see that the student has given valid reasons for his or her stand.

Section 3: Activity 5

Answers will vary, but may include

- improving crop yields, storage, and transportation in other countries so the people can feed themselves
- working for the conservation of natural resources used to produce food
- researching new crop varieties that will grow in harsh conditions
- using public opinion to help solve the political problems that keep people hungry

Note: The student should now read the Conclusion for this section, and the Module Summary; then, complete the Section 3 (Part A) Assignment and the Final Module Assignment for Part A in the Module 4 Assignment Booklet.

Section 3 (Part A): Assignment Answer Key (25 marks)

1. Answers will vary. At least two items should be listed.
 - Award one mark (to a maximum of two marks) for each appropriate selection or creation.
 - Award two marks (to a maximum of four marks) for describing what each item shows about the worldwide nature of the food system. **(6 marks)**
2. Answers will vary. At least three items should be listed.
 - Award one mark (to a maximum of three marks) for each appropriate selection or creation.
 - Award one mark (to a maximum of three marks) for describing the problem shown by each item.
 - Award one mark (to a maximum of three marks) for suggesting a reason for the problem shown by each item. **(9 marks)**
3. Answers will vary.
 - Award one mark (to a maximum of five marks) for each appropriate selection or creation. **(5 marks)**
 - Award one mark (to a maximum of five marks) for describing each career. **(5 marks)**

Final Module Assignment for Part A: Assignment Answer Key (20 marks)

1. The final presentations prepared by the students will vary depending on the format chosen and the items created or gathered. Check to see how well the instructions were followed. Award marks as follows:
 - overall creativity **(5 marks)**
 - completeness **(5 marks)**
 - quality of presentation **(5 marks)**
 - quality of information **(5 marks)**
2. Award a bonus five marks for a signed evaluation form and comments on the presentation. **(5 marks)**

Note: 1. A final grading for Module 4 can now be determined for students who completed Part A.

2. **The student should now have completed and been assigned gradings for all four modules of this course. A final grading for Agriculture: Land and Life/Year Three should now be determined.**

Part B: Projects

Note: Part B must be done by those students who have previously completed Agriculture: Land and Life/Year One or Agriculture: Land and Life/Year Two. (If the student's first enrolment is the Agriculture: Land and Life/Year Three level, then Part A must be done.)

Section 1 (Part B): Selecting Your Projects

Key Concepts

In this project section students will

- select and plan two projects
- review the background information on their topic choices

Section 1: Activity 1

1. Selections will vary. Check and discuss your students' choices of topics and assignments to ensure that they are appropriate for the students' learning situation.

Each project should represent about 7 1/2 hours of work or ten 45-minute class periods. If students plan to display their project as part of a class agricultural exhibition, they will need one period for setting up and another period for looking at exhibits and talking with people about their work.

2. a. Answers will vary. Be sure that students have selected all of the resources that are available from the list – they may not recognize some sources of information.
b. Check to see if students were able to identify additional sources of information that weren't included in the list in the Student Module Booklet.
3. Answers will vary. The Student Module Booklet describes several possible formats. Be sure that the assignment formats suit the learning situation for the projects chosen and can be marked by the teacher. For some students the format must be one that can be mailed in for marking. For example, students in a classroom situation may appreciate projects involving displays and demonstrations that can be exhibited as part of a class fair or agricultural exhibition. However, even displays and demonstrations need not be limited to students in classroom situations, if they could be packaged and mailed for marking, or have photographs taken of the display to accompany a written report which can be mailed.

Section 1: Activity 2

This activity includes the basic background information to help students get started, and some study questions to guide their research. Students should read the background information for their projects in this section and answer the questions as required to prepare themselves for completing the assignments for their two selected projects in the Assignment Booklet. If the initial project choices are found to be inappropriate, the students may need to change their project choices to ones that are more suited to their situation.

Project Topic A. The Business Side of Farming

1. Answers will vary. Proper lighting, comfortable furniture, adequate storage space, a properly organized work area, and quiet surroundings are some important items to consider. Depending on the type of office, perhaps a printer and a computer are necessary.

2.

Grain Farm		Cow-Calf Ranch	
Expenses	Income	Expenses	Income
repairs	hay sales	repairs	sale of calves
seed	seed sales	seed	stud fees for bulls
fertilizer	grain sales	feed	sale of other livestock
herbicides	rental of land	herbicides	sale of surplus feed
pesticides	sale of assets	pesticides	
power	crop insurance	veterinary costs	
fuel	stabilization	interest	
interest	payments	fuel	
farm equipment		livestock purchases	
land		medicines	
depreciation		payments on land	
payments on land		and equipment	
and equipment		depreciation	
insurance premiums		insurance premiums	

3. Answers will vary. Check to see that students' sources of income and the stated expenses are reasonable for their situation.

4.

YEARLY BUDGET FOR CROP PRODUCTION	
Item	Amount (\$)
A. Income from 1000 acres of barley	
(1) Barley grain sales @ 57 bu./acre & \$1.60/bu.	91 200
(2) GRIP payments	34 200
(3) Straw @ \$10/acre	10 000
	<hr/>
A. Gross income from barley	135 400
B. Income from 1000 acres of canola	
(1) Canola seed sales @ 22 bu./acre & \$6.00 bu.	132 000
(2) GRIP payments	14 300
	<hr/>
B. Gross income from canola	146 300
C. Income from 1000 acres of wheat	
(1) Wheat grain sales @ 42 bu./acre & \$2.70/bu.	113 400
(2) GRIP payments	60 900
(3) Straw @ \$10/acre	10 000
	<hr/>
C. Gross income from wheat	184 300
D. Direct expenses	
(1) Seed	8 000
(2) Fertilizer	19 500
(3) Chemicals	16 000
(4) Machinery maintenance & operating costs	23 000
(5) Casual labour costs	3 000
	<hr/>
D. Total direct expenses	69 500
E. Indirect expenses	
(1) Taxes	4 000
(2) Miscellaneous overhead	6 350
(3) Equipment and building depreciation	6 000
(4) GRIP premiums	14 000
	<hr/>
E. Total indirect expenses	30 350
F. Potential Net Income	
(1) Barley = (A – D – E)	35 550
(2) Canola = (B – D – E)	46 450
(3) Wheat = (C – D – E)	84 450

Step A(1) Earnings from barley sales = \$91 200 ($1000 \times 57 \times \1.60)(2) GRIP payments = \$34 200 ($1000 \times \0.60×57)(3) Income from straw = \$10 000 ($\10×1000)Gross income from barley = \$135 400 ($\$91\,200 + \$34\,200 + \$10\,000$)

Step B

(1) Earnings from canola sales = \$132 000 ($1000 \times 22 \times \6.00)

(2) GRIP payments for canola production = \$14 300 ($1000 \times \0.65×22)

Gross income from canola = \$146 300 ($\$132\,000 + \$14\,300$)

Step C

(1) Earnings from wheat sales = \$113 400 ($1000 \times 42 \times \2.70)

(2) GRIP payments for wheat production = \$60 900 ($1000 \times \1.45×42)

(3) Income from straw = \$10 000 ($\10×1000)

Gross income from wheat = \$184 300 ($\$113\,400 + \$60\,900 + \$10\,000$)

Step D

(1) Seed costs = \$8 000 ($1000 \times \8.00)

(2) Cost of anhydrous nitrogen = \$10 000 ($1000 \times 20 \times \0.50)

Cost of broadcast fertilizer = \$9 500 ($\9.50×1000)

Total cost of fertilizer = \$19 500

(3) Cost of chemicals = \$16 000 ($1000 \times \16.00)

(4) Machinery costs = \$23 000 ($\23×1000)

(5) Costs of casual farm labour = \$3 000 ($1000 \times \3.00)

The total direct expenses = \$69 500 ($\$8\,000 + \$19\,500 + \$16\,000 + \$23\,000 + \$3\,000$)

Step E

(1) Taxes = \$4 000 ($\4.00×1000)

(2) Miscellaneous overhead = \$6 350 ($1000 \times \6.35)

(3) Depreciation = \$6 000 ($1000 \times \6.00)

(4) GRIP premiums = \$14 000 ($\14.00×1000)

The total indirect expenses = \$30 350 ($\$4\,000 + \$6\,350 + \$6\,000 + \$14\,000$)

Step F

(1) Potential net income from barley = $\$135\,400 - \$69\,500 - \$30\,350$
= \$35 550

(2) Potential net income from canola = $\$146\,300 - \$69\,500 - \$30\,350$
= \$46 450

- (3) Potential net income from wheat = $\$184\ 300 - \$69\ 500 - \$30\ 350$
 $= \$84\ 450$
5. Growing wheat would make the highest profit thanks to a generous subsidy. This is a good example of how agricultural subsidies can encourage over-production.
 6. Answers will vary. Equivalent earnings could be made from higher yields, perhaps due to better moisture reserves in the soil in spring, through the increased use of fertilizer, or perhaps better market prices for the crops.
 7. This question is meant to give students some practical understanding of the term *solvent*. Since most students in junior high will have clothing and some other belongings as assets but will have few liabilities, they will likely come up with a positive net worth.

Project Topic B. Computers and Agriculture

If your students have computers at home or are able to use computers at school (with or without a modem) for about five periods, they will be able to create a spreadsheet "model" of farm finances and do a communications enrichment activity. Otherwise, they may research applications of a computer on the farm, or build a small-scale model or display showing the parts of a computer-controlled mechanical system.

1.
 - a. The input devices include a keyboard, mouse, floppy disk drive, hard disk drive, scanner, a CD-ROM drive, and modem.
 - b. The output devices include a monitor, printer, and a modem.
 - c. The internal memory consists of the CPU (central processing unit) which contains a built-in hard disk drive and a floppy disk drive.
 - d. The external memory consists of a floppy disk drive and a CD-ROM drive. Extra external memory can be provided by an external hard disk drive.
2.
 - a. Lighting, temperature, moisture, nutrients, soil acidity, humidity, and carbon dioxide levels must be controlled for optimum plant growth in the greenhouse.
 - b. The input devices in a greenhouse may include
 - photocells or light meters for light levels
 - hygrometer for humidity
 - ohmmeter for soil conductivity (salinity)
 - thermometers and thermostats for temperature
 - pH meter for soil acidity
 - c. Output devices that could be used to control the conditions identified in question a. are
 - light – artificial lights, movable shades
 - temperature – heaters, fans, blinds, vents
 - moisture – watering systems, misters
 - nutrients – nutrient solution dispensers
 - salinity or acidity – chemical dispensers
 - CO₂ levels – open-flame stoves or other CO₂ generators
3. Work done on a word processor can be easily corrected, can be edited without retyping, and can be saved and printed in different forms.
4. The value of E5 is \$2.50, of E9 is \$10 000, and of F17 is \$49 200.
5. Here is what the numbers for the formulas would look like:
 - a. in cell F3: $400 \times 60 \times \$1.80 = \$43\ 200.00$
 - b. in cell F4: $400 \times 35 \times \$6.00 = \$84\ 000.00$
 - c. in cell F5: $400 \times 50 \times \$2.50 = \$50\ 000.00$

6. Here is what the numbers which are added by the formulas would look like:

- a. in cell F6: $\$43\,200.00 + \$84\,000.00 + \$50\,000.00 = \$177\,200.00$
- b. in cell F15: $\$10\,000 + \$35\,000 + \$20\,000 + \$40\,000 + \$8\,000 + \$15\,000 = \$128\,000.00$
- c. in cell F17: $\$177\,200.00 - \$128\,000.00 = \$49\,200.00$

7. Spreadsheet

- many calculations at once
- formulas and data stored on disk
- very fast

Calculator

- single calculations
- formulas and data lost when turned off
- comparatively slow

8. Answers are many and may include

- selection by source and ordered numerically
- selection on the basis of purchase or sale date and ordered by date
- ordered on the basis of most rapid weight gain
- ordered on the basis of finished weight
- grouped by feeding schedule and ordered by time to market

9. Answers will vary. A modem can be used to transmit computerized information using the telephone system. It can be used for such things as downloading information from computer bulletin boards, swapping files between computers, obtaining the latest stock market reports, participating in computer auctions of livestock, or shopping and banking from home.

10. Computers are only as smart as the user. They can do calculations but cannot (yet) think for themselves.

11. Young farmers are more apt to adopt computer technology for the following reasons:

- They are more familiar with the use and applications of computers.
- They have not already established manual methods of bookkeeping and record keeping.
- There is considerable learning that must take place for this tool to be effective. Sometimes it is not the best use of a farmer's time!

Project Topic C. World Agriculture

In this assignment students will investigate foods and farming methods from other countries.

1. Students should be able to come up with some answers from general knowledge, or perhaps an examination of food shelves in the kitchen or a grocery store might help. Some imported crops and where these crops are grown include the following:

- rice – Far East
- coconuts – Pacific Rim
- bananas – Central and South America
- oranges – California, Florida, Mexico, South America
- pineapples – Hawaii
- coffee – South America (Brazil)
- kiwi fruits – New Zealand
- tea – Sri Lanka and West Africa

- 2. a. rice: China, Pacific Rim countries, India, Indonesia, and Bangladesh are countries which grow rice and use it as a staple food.
- b. wheat: The Western Hemisphere including Europe, U.S.A., and Canada, and the former USSR grow and use wheat as a staple food.
- c. corn: U.S.A., China, Mexico, and South American countries grow and use corn as a staple food.
- d. pulses: These are grown and used extensively in Mexico and South America.

- e. millet: Millet is grown and used as a staple food in China, India, and North America.
 - f. cassava: West Africa and Central and South America grow and use cassava as a staple food.
 - g. potatoes: These are grown and used extensively in China, the former USSR, Poland, and North America.
 - h. sorghum: Sorghum is grown and used as a staple food in China, India, and North America.
3. Nutrients contained in the rain forest are concentrated in the soil by burning. They are then removed as crops are harvested or they are washed away by tropical rains. The land loses its productivity. As a result slash-and-burn agriculture is not a successful method of farming.
 4. Answers will vary. Appropriate technology meets the immediate needs of the people within the existing social structure.
 5. Dangers of unregulated pesticide use include
 - contamination of food, water, soil, and livestock
 - destruction of wildlife
 - possibility of increased disease in people
 6. Answers will vary, depending upon the country the student chooses to study.
 7. a. Answers will vary, depending upon the country the student chooses.
 - b. Answers will vary, depending upon the country the student chooses. Small parcels usually mean inefficient farming and a lower standard of living for the landowner.
 8. Answers will vary but areas of difference may include number of farmers as a percentage of the population, size of farms, ownership of land, level of mechanization, types of crops, levels of chemical inputs such as commercial fertilizer, regulation of pesticide use, wages of farm labour, level of government support to farmers, and levels of productivity.

Project Topic D. Agricultural Systems and Services

In the description of farming in Canada, included as background information, students can see that the efficiency of Canadian farmers is due to the efforts of many people. They will use this description to help identify the many suppliers of goods and services to the farmer.

1. Businesses, institutions, goods, and services that help farmers to be more productive include
 - research institutions at universities, government labs, and industries
 - marketing boards and co-operatives
 - equipment manufacture and sales
 - fertilizer manufacture and sales
 - chemical manufacture and sales
 - government control agencies
2. Answers will vary. Students may find examples in the yellow pages of their telephone book or from Alberta Agriculture offices or from the local agricultural specialists (crop, beef, pork, rural development, etc.). The *Alberta Farm and Ranch Directory* is also a good source of information.
3. Answers will vary. Check to see if students have obtained any promotional literature or samples from local services.

Project Topic E. Preserving and Processing

There are many aspects of food processing. Food processing involves changes to a raw food material to make it more nutritious, to make it more appealing, or to improve its storage characteristics. In this project, students will compare commercial processes to those used at home. They may wish to do a practical activity involving the canning of fruit. If possible, try to provide space in home economics facilities so students may do the practical parts of the activity in school. If space is not available at school they should do this part of their assignment at home. Distance education students may mail in a report along with a letter of verification from a parent.

1. The steps are designed to create the best quality product. The canned peas must be palatable, safe, meet a consumer need, and be as good if not better than the competition.
2. Examples of foods preserved by the following methods include

a. pasteurization: processed cheese, milk, cottage cheese	e. cold storage: dairy products, fruit, meat
b. sterilization: canned fruit, vegetables	f. dehydration: dried fruit, noodles, dried soups
c. blanching: frozen vegetables	g. removing oxygen: vacuum-packed sandwiches
d. smoking: smoked bacon and other meats, smoked fish	h. chemical methods: sausages, luncheon meats
3. The risk of illness from a food additive is very small due to regulation and testing. Labelling of packages can prevent accidental consumption by people with allergies. The risk of developing diseases such as cancer is always present and must be monitored. If a food additive is found to be unsafe it will be removed.
4. Check to see that the student has done some research and has made notes on either drying or freezing as a method of preserving fruits.

Project Topic F. Agricultural History

In this activity students are encouraged to focus on a particular period of history or, on the development of a particular type of farm technology.

1. Check to see if students have looked up some references and made notes on either
 - the farming methods used by an ancient civilization
 - the development of the tractor, mechanical seeder, plow, or cultivator
2. Students may ask for your help in arranging a tour to a farm equipment museum, for example, the Reynolds Museum in Wetaskiwin. If students do visit a farm equipment museum, check to see if they made any notes on the changes in the development of a particular type of farm equipment.

Project Topic G. Home Gardening

This topic is presented as an example of practical agriculture. It is best done in the spring so that the planning involved in this topic can be used to start a garden.

1. Answers will vary. The student's plans should be consistent with the answer here.
2. Answers will vary. The student's plans should be consistent with the answer here.
3. Answers will vary. It may be because they enjoy gardening, enjoy fresh vegetables, or it might be to fulfil the requirements for their project.
4. Answers will vary. Some may prefer a variety of vegetables for salads; others might prefer to grow vegetables such as peas and carrots for eating raw, freezing, etc.

5. Answers will vary. Check to see that the values for the amounts of vegetable and length of row in the chart are reasonable. The following chart may be used as a guide.

Vegetable	Approximate Amount per 5-metre Row	Vegetable	Approximate Amount per 5-metre Row
Beans	10–15 litres	Lettuce (head)	15–20 heads
Beets	75–100 roots	Onions (green)	8–10 kg
Broccoli (Early)	5 to 10 litres	Spinach (2 crops)	30–50 litres
Cabbage	10 heads	Peas (in pods)	5–10 litres
Carrots	5–10 kg	Radishes	15–25 bunches
Chard	Use all season	Tomatoes	50–100 fruits
Corn	40–50 ears	Turnips	50–75 roots
Cucumber	30–50 fruits	Zucchini	30–50 fruits

6. Answers will vary. Use the following table as a guide to correct student answers. See the note following the chart.

Vegetable	Seeding Depth (cm)	Distance Between Rows (cm)	Distance Between Plants (cm)	Amount of Seeds Needed* (g)	Time to Maturity (days)
Beans	2.5–4	60–90	8–10	40–70	50–70
Beets	1–2.5	30–60	5–10	2.5–4	55–70
Broccoli	0.5–1.5	45–90	30–45	45	65–80
Cabbage	0.5–1.5	60–90	35–50	0.6–1.2	60–80
Carrots	0.5–1	30–60	2.5–5	0.6–2.5	60–70
Chard	1.2–2.5	30–60	10–20	2.5–4.5	all season
Corn	2.5–4	60–90	30–40	20	75–120
Cucumber	2–5	120–180	20–30	2.5	100–150
Lettuce	0.5–1	30–60	20–35	0.6–2.5	40–75
Onions	1–2	15–30	5	2.4–5	75–90
Peas	2.5–5	15–60	7–8	40–75	60–75
Radishes	0.5–1.5	20–30	2.5–5	2.5–4	25–35
Tomatoes	1–1.5	60–90	45–60	0.3–0.6	120–200
Turnips	0.5–1.5	30–40	10–15	0.6–1.2	50–70
Zucchini	2–5	120–180	20–30	a few seeds	50–70

Note: * The answers here are given in grams needed to plant a 5 m row. Students should state the amount of seeds in grams needed for the length of row they plan to plant. However, seed spacing information from the package may be used instead. The seed spacing information could be used to calculate the number of seeds required for planting each one-metre length of row, keeping in mind that thinning will likely be needed after germination to arrive at the correct distance between individual plants.

The numbers included in the table are for early maturing varieties only. This chart is also used as the reference for assignment question 2 in Project Topic G.

7. Check student plans to see that students

- used recommended row spacing
- arranged rows across a slope to prevent erosion and loss of seed
- placed crops with similar growing conditions together
- did not place tall plants in front of short plants, resulting in unwanted shading

8. Answers will vary. Testing will require a soil-testing kit or suitable pH paper. Soil pH should be in the range 6.5–7.5.

9. As soon as the ground is dry enough to till, spread fertilizer in the form of manure (25 kg per 10 m²) or commercial fertilizer (5-10-10 or other fertilizer that is recommended for your particular soil, at the recommended rate stated on the container) on top of the soil.

Turn or mix the soil with a fork or rototiller and rake smooth.

10. Check the students' charts for a list of plants that need to be started early and later transplanted because they require more than 100 days to mature. Check to see that the time to maturity, starting dates, and the dates when the plants can be moved outdoors safely are reasonable for your area.

Section 1: Follow-up Activities

If your students experienced difficulty with this section, have them continue with the Extra Help. Otherwise, they may go on to the Enrichment.

Extra Help

If students are having problems in deciding on which two projects to do, they should be able to get started after reading the summary included as Extra Help. It is a good idea to check for progress at this time.

Enrichment

Students are encouraged to complete the activities that correspond to their two chosen topics.

A. The Business Side of Farming

Answers for this activity will vary. Look for proper organization of the budget. Check to see that the expenses and the amounts of produce to be produced are reasonable for the area in which the chosen business is to be located. Check students' calculations of the potential gross income and potential net income. Point out any hidden business expenses which students may not have accounted for in the budget.

B. Computers and Agriculture

1. a. Some repetitive tasks include budgeting, keeping records of purchases, keeping livestock records, calculating a balance sheet, controlling mechanical feeding systems, and keeping records and expenses of tillage, planting, fertilizing, spraying, watering stock, indoor or outdoor lighting, and milk production.
- b. Answers will vary. All of the tasks listed in question 1.a. can be controlled by computer; the student may list some tasks that cannot yet be controlled by computers. Check to see that the input and output devices identified are suitable to the tasks that the student identified.

c. Answers will vary, but must be reasonable uses that the student would have for a computer.

2. Computers vary in price as do the prices of software programs. Cost is a significant factor but this must be balanced against savings or extra profits that can be attained by the use of the computer. A person should also consider the memory capabilities the computer will need to carry out the tasks one wants it to do.

C. World Agriculture

1. Answers will vary. One solution might be for these farm workers to be paid higher wages. At the moment however, wages are kept low because of an abundance of labour and an unwillingness by landowners to accept organized labour.
2. Answers will vary, depending on the country the student selected to study.

D. Agricultural Systems and Services

1. The Canadian food production system is becoming more dependent on non-renewable resources through such things as increased use of fuel for equipment, and increased use of commercial fertilizers and pesticides.
2. The implication of this trend is that farmers and consumers are becoming dependent on these types of supports, but as non-renewable resources become short in supply, alternate sources will need to be found.
3. Conservation should be encouraged to reduce our reliance on non-renewable resources.

E. Processing and Preserving

Some food processing plants will allow students to tour their factory. If possible, help the student arrange such a tour with a small group of other interested students. Alternatively, help them to obtain a videotape of a commercial processing plant.

F. Agricultural History

Answers may include

- Irrigation was invented in Mesopotamia and Egypt about 4000 B.C.
- Use of crop rotation by the Romans kept fields fertile.
- In about 600 A.D., wheels were added to the plow in Europe.
- Jethro Tull invented the mechanical seed drill that was used in Britain and North America.

G. Home Gardening

1. Advantages include
 - produce is free of chemical pesticides
 - waste plant material can be recycled as compost
2. Disadvantages include
 - more work
 - damage to produce from pests is more likely
3. Answers will vary depending on the plants selected and the textbook resources used. Many books have been written on the topic. Companion planting is a topic that lends itself to interesting discussions as many organic gardeners who follow this technique are convinced of its benefits. Yet, there seems to be little proof to support the claims.

Note: Students should now read the Conclusion for this section; then, turn to their Assignment Booklets and complete the Section 1 (Part B) Assignment.

Section 1 (Part B): Assignment Answer Key (20 marks)

1. a. Answers will vary. Project 1 should be labelled A. to G. (No marks)

Look for a complete description of the topic and the nature of the project that the student selected as Project 1. The answer here will likely parallel quite closely the information given for one of the seven choices described in the Student Module Booklet. (2 marks)

- b. Look for a statement of objectives that can be achieved in the time allotted for the student's selected Project 1. Students are to formulate their own learning objectives. (3 marks)
 - c. Because research is a part of all projects, students should have several references and/or other sources such as Agriculture: Land and Life module booklets, museums, names of clubs, commodity groups, equipment dealers, fertilizer and food outlets, or other resource people such as friends or relatives who work in the agriculture and food industries listed for their Project 1. (5 marks)
2. a. Answers will vary. Project 2 should be labelled A. to G. (No marks)

Look for a complete description of the topic and the nature of the project that the student selected as Project 2. The answer here will likely parallel quite closely the information given for one of the seven choices described in the Student Module Booklet. (2 marks)

- b. Look for a statement of objectives that can be achieved in the time allotted for the student's selected Project 2. Students are to formulate their own learning objectives. (3 marks)
- c. Because research is a part of all projects, students should have several references and/or other sources such as Agriculture: Land and Life module booklets, museums, names of clubs, commodity groups, equipment dealers, fertilizer and food outlets, or other resource people such as friends or relatives who work in the agriculture and food industries listed for their Project 2. (5 marks)

Section 2 (Part B): Reporting On Your Projects

Key Concepts

In this section students will

- continue research on their two projects to identify any additional information they need
- produce presentations or written reports on their projects
- evaluate the success of their projects

Section 2: Activity 1

All students are expected to do research as part of this activity – whether through books, clubs, or resource people. They are required to record sources of information. They should cite the author, title, publisher, and date of publication for books.

Further help with location of resources is provided in the Extra Help at the end of the section.

Section 2: Activity 2

The information in this section is provided to help with the assignments in the Assignment Booklet. Further help is provided in the Extra Help at the end of this section.

1. Answers will vary. Check to see if students understand their assignments and if the formats that they choose are appropriate for the projects and their particular learning situation.
2. Check the student's materials list for feasibility of choices.

Section 2: Follow-up Activities

If students experienced difficulty with this section they should continue with the Extra Help. Otherwise, they should go on to the Enrichment.

Extra Help

Extra help is provided at this point with suggested locations of resources and suggested preparation of special assignments. Students should discuss any further difficulties with the learning facilitator. Some suggested references include the following:

- For Computers and Agriculture

Murphy, Wendy B. 1984. *The Future World of Agriculture*. Walt Disney Productions.

- For Agricultural Systems and Services

Alberta Ranch and Farm Directory. 1994. Calgary, Alberta: North Hill News Inc.

- For Agricultural History

Men, Machines and Land. 1974. Chicago, Illinois: Farm and Industrial Equipment Institute.

Murphy, Wendy B. 1984. *The Future World of Agriculture*. Walt Disney Productions.

Enrichment

Students are encouraged to complete the activities that correspond to their two chosen topics.

A: The Business Side of Farming

1. Answers will vary but daily prices of farm commodities can be found in the business section of most major daily newspapers.
2. Answers will vary but futures market quotes for grains can be obtained in the business section in the weekend edition of most major newspapers.

Farm market reports are also carried on some radio stations, and they may quote futures market prices for grains in addition to the daily prices of farm commodities.

B: Computers and Agriculture

The COMPU-FARM computer bulletin board service can be used to

- obtain farm management information
- read the news
- leave messages
- download programs and information
- obtain or change a password
- read messages
- obtain market reports
- send electronic mail messages

C: World Agriculture

Answers will vary, depending on the student's choices of foods.

D: Agricultural Systems and Services

Answers will vary. A copy of the magazine *Alberta Farm and Ranch Directory* (see the bibliography information under the preceding Extra Help) is a good resource for checking the variety of services available to farmers.

E: Preserving and Processing

Answers will vary, depending on the fruits or vegetables chosen and on the preservation methods used.

F: Agricultural History

- Most likely, the method chosen by the student is no longer used in Canada because of inefficiency and replacement by better technology.
- The particular tool chosen by the student might be used elsewhere in the world where there is a lack of money and a greater reliance on traditional methods. New technology also requires a high degree of technical education which may be lacking in various countries.

G: Home Gardening

If it is springtime, the student may wish to plant the garden that was planned earlier. Indoor planting could be done at any time of the year.

Note: Students should now read the Conclusion for this section; then, turn to their Assignment Booklets and complete the Section 2 (Part B) assignments for the two projects they selected.

Section 2 (Part B): Assignment Answer Key (60 marks)

Correct the assignments for the **two** projects which students have selected. Each project has a value of 30 marks for a possible total of 60 marks.

Project Topic A. The Business Side of Farming (30 marks)

- Students are to do either a. or b. Only the format differs. The features which would be part of the office floor plan should include items such as

- | | |
|--|-------------------|
| • shelving for reference books, periodicals, and technical reports | • wastebasket |
| • filing systems for financial records, livestock records, etc. | • desk and chair |
| • computer and printer | • proper lighting |
| • pocket calendar/day timer | |

(4 marks)

- INCOME

Cash from barley deliveries	\$48 000
Cash from straw deliveries	\$5 000
Cash from canola deliveries	\$72 000
GRIP payments	\$14 500

GROSS INCOME = \$139 500

EXPENSES

Barley seed	\$8 000
Canola seed	\$8 000
Fertilizer	\$20 000
Chemicals	\$14 000
GRIP premiums	\$14 000
Machinery maintenance	\$20 000
Contract labour costs	\$3 500
Property taxes	\$4 000
Miscellaneous expenses	\$6 000
Depreciation on equipment and buildings	\$6 000
Interest on farm debt	\$10 000

EXPENSES = \$113 500

Gross Income	\$139 500
– Expenses	– 113 500
= NET INCOME	\$ 26 000

The net income for the farm is positive, so the farm showed a profit. The profit was \$26 000 for this farm. **(4 marks)**

Note: Some students may choose to organize the income and expenses into a chart.

- The farmer earned \$26 000. He worked 45 hours a week for 49 weeks ($52 - 3$). $\$26\,000 / (49 \text{ weeks} \times 45 \text{ hours}) = \$11.79/\text{hr}$. The farmer earns \$11.79 per hour. **(2 marks)**

4. Assets:	Land	\$500 000	Total Assets	\$1 170 000
	Buildings	200 000	less Total Liabilities	<u>317 000</u>
	Equipment	350 000	NET WORTH	\$853 000
	Income from crop	<u>120 000</u>		
	TOTAL	\$1 170 000		
Liabilities:	Loans:	Land	\$150 000	
		Tractor	100 000	
		Bills	<u>67 000</u>	
	TOTAL	\$317 000		

The net worth of the Jones farm is \$853 000. (4 marks)

5. The following is one example. Income amounts will vary depending on the acreage seeded to each crop.

YEARLY BUDGET FOR CROP PRODUCTION	
Item	Amount (\$)
A. INCOME FROM 400 ACRES OF BARLEY	
(1) Barley grain sales @ 80 bu./acre & \$1.60/bu.	51 200
(2) Straw @ \$10/acre	<u>4 000</u>
A. Gross income from barley	55 200
B. INCOME FROM 200 ACRES OF CANOLA	
(1) Canola seed sales @ 35 bu./acre & \$6.00 bu.	<u>42 000</u>
B. Gross income from canola	42 000
C. INCOME FROM 400 ACRES OF WHEAT	
(1) Wheat grain sales @ 60 bu./acre & \$2.70/bu.	64 800
(2) Straw @ \$10/acre	<u>4 000</u>
C. Gross income from wheat	68 800
D. DIRECT EXPENSES	
(1) Seed	8 000
(2) Fertilizer	34 500
(3) Chemicals	16 000
(4) Machinery maintenance & operating costs	23 000
(5) Casual labour costs	<u>3 000</u>
D. Total direct expenses	84 500
E. INDIRECT EXPENSES	
(1) Taxes	4 000
(2) Miscellaneous overhead	6 350
(3) Equipment and building depreciation	<u>6 000</u>
E. Total indirect expenses	16 350
F. POTENTIAL NET INCOME = (A + B + C - D - E)	\$65 150

These amounts may vary depending on the acreage seeded to each crop.

The various calculations for the preceding example are made as follows (crop acreages may vary):

A. Gross income from barley

(1) barley sales	
400 acres × 80 bu./acre × \$1.60/bu. =	\$51 200
(2) straw sales	
400 acres × \$10.00/acre =	<u>4 000</u>
Total =	\$55 200

B. Gross income from canola

(1) canola sales	
200 acres × 35 bu./acre × \$6.00/bu. =	<u>\$42 000</u>
Total =	\$42 000

C. Gross income from wheat

(1) wheat sales	
400 acres × 60 bu./acre × \$2.70/bu. =	\$64 800
(2) straw sales	
400 acres × \$10.00/acre =	<u>4 000</u>
Total =	\$68 800

D. Direct expenses

(1) Seed @ \$8.00/acre	
1000 acres × \$8.00/acre =	\$8 000
(2) Fertilizer	
82-0-0 fertilizer	
1000 acres × 50 kg/acre × \$0.50/kg =	\$25 000
8-38-15 fertilizer	
1000 acres × \$9.50/acre =	<u>\$9 500</u>
Fertilizer Total =	\$34 500
(3) Chemicals	
1000 acres × \$16.00/acre =	\$16 000
(4) Machinery maintenance & operating costs	
1000 acres × \$23.00/acre =	\$23 000
(5) Casual labour costs	
1000 acres × \$3.00/acre =	<u>\$3 000</u>
Total =	\$84 500

E. Indirect expenses

(1) Taxes	
1000 acres × \$4.00/acre =	\$4 000
(2) Miscellaneous overhead	
1000 acres × \$6.35/acre =	\$6 350
(3) Equipment and building depreciation	
1000 acres × \$6.00/acre =	<u>\$6 000</u>
Total =	\$16 350

Potential Net Income

A + B + C – D – E

= \$55 200 + \$42 000 + \$68 800 – \$84 500 – \$16 350

= \$65 150 The potential net income is \$65 150.

(10 marks)

6. Answers will vary. Either side of the argument is acceptable, provided it is supported by valid or justified reasons. The potential income with GRIP ranges from \$35 550 to \$84 460; potential earnings without GRIP are around \$65 000. **(2 marks)**
7. Poor weather can produce low yields due to hail, drought, a wet spring or fall, or an early winter. Diseases or pests may also reduce crop yields. This could mean a lower income in some years. **(2 marks)**
8. A computer is a useful tool for preparing budgets, income statements, and balance sheets. A database can be updated on a regular basis as a source of information. A spreadsheet can do similar calculations quickly. It can be a tool for budgeting that will allow different operating situations to be “modelled.” **(2 marks)**

Project Topic B. Computers and Agriculture (30 marks)

1. Advances in computer technology are very rapid. Answers which are not listed may be given.
 - a. Any six of these input devices could be listed:

• keyboard	• mouse	• microphone
• thermostat	• radio signal	• CD-ROM drive
• scale	• joystick	• modem
• clock or timer	• synthesizer	• video recorder
• scanner	• disk drive (floppy or hard)	• fax machine (3 marks)
 - b. Any four of these output devices could be listed:

• CRT tube (monitor)	• printer	• disk drive (floppy or hard)
• robot arm	• switches	• fax machine (2 marks)
• lights	• modem	
 - c. Any two of these data storage devices (external memory) could be listed:

• floppy disk	• hard disk drive
• compact disc (laser videodiscs)	• magnetic tape (2 marks)
 - d. The central processing unit
 - controls operations and manages memory
 - contains basic operating instructions in ROM
 - runs programs and processes information **(3 marks)**
2. Students are to do only **one** of 2.a., 2.b., or 2.c.
 - a. This report should include a description of at least three applications. **(20 marks)**
 - b. This display may be set up using an actual computer and special software such as that available for the computer model you have. For example, software for the Apple II may include Science Toolkit Master Module, BankStreet Laboratory, or Experiments in Science. Alternatively, students may use pictures or photographs together with a written report to illustrate the relationship between various components. **(20 marks)**
 - c. Students should be referred to their own software manual or computer clubs for help with this activity if the spreadsheets submitted are not set up to show the information asked for.
 - i. On the sample spreadsheet in the background information to Project Topic B in (Part B) Section 1: Activity 2 in the Student Module Booklet, the net income (profit) was \$49 200. With the expenses increasing \$5000 for fertilizer, \$5000 for chemicals, and \$10 000 for machinery, the total expenses become \$148 000. The new profit would be $\$177\,200 - \$148\,000 = \$29\,200$.
 - ii. Doubling the price for barley would change the income from barley to \$86 400 from \$43 200. This would result in an increase in profit of \$43 200. The new profit (net income) would become \$92 400.

- iii. Check to see that three separate computer print-outs have been received, one for each of the following crops: barley, canola seed, and wheat. The total farm acreage is 1200 acres. All 1200 acres planted into canola seed would produce the most income based on the yield and price stated for canola. The 1200 acres yielding 35 bushels per acre at a price of \$6.00 per bushel would result in a total income of \$252 000 (compared to \$129 600 for barley and \$150 000 for wheat) for this farmer. The farmer may decide to switch to monoculture farming, but there are risks. Diversification of crops is usually recommended to reduce the risk of a sudden downturn in price of a given commodity. Also rotation of crops reduces the risk of cereal crop diseases.

(20 marks)

Project Topic C. World Agriculture (30 marks)

Students who have chosen the topic of World Agriculture for one of their projects will answer question 1 **or** question 2.

1. Answers will vary, but the report or display about a crop not grown in North America should include the following:
 - a brief description of the crop and its uses
 - a map showing the places where this crop is grown in the world
 - a description of climate and other conditions required for growth
 - a description of how the crop is grown
 - a description of how the crop is processed and marketed (30 marks)
2. Answers will vary, but the report or display on farming methods used in another country should include information on the following:
 - the name of the country and its location on a world map
 - a map that shows the main farming areas and the crops produced
 - the percentage of people employed in farming
 - equipment and methods used
 - types of crops grown
 - the system of land ownership
 - the level of mechanization
 - special geographic or social conditions that affect the development of agriculture in that country (30 marks)

Project Topic D. Agricultural Systems and Services (30 marks)

1. Students are to identify several local examples of **two** agricultural systems and services. Answers will vary. Students may find examples in the Yellow Pages of their telephone book, from Alberta Agriculture offices, or from their local agricultural specialists. (10 marks)
2. Answers will vary, but are to include
 - a description of the service along with its full range of activities
 - pictures (from promotional literature) to illustrate the ways that farmers use the service
 - a description of the value of this service to the farm community
 - a description or a chart to show the range of occupations that are used to provide the service
 - a description of the support provided by any other businesses, institutions, or individuals that is essential to the organization that the student is reporting on (20 marks)

Project Topic E. Preserving and Processing (30 marks)

- Answers will vary. Some reasons for the processing of food include
 - preservation
 - consumer acceptability
 - public health
 - market demand
 - market expansion**(5 marks)**
- The steps that might be needed if peas were to be canned at home include
 - harvesting
 - shelling and cleaning
 - washing
 - cooking
 - sealing
 - filling
 - cooling
 - labelling**(3 marks)**
- More steps are involved in a commercial process to improve the quality of the product, to meet consumer demands, and to capture a greater share of the market. The home consumer wants a quality product as well, but commercial industries are set up for mass production and machine production. There must be a consistency in product and in speed of production. Processing in tins also differs from processing in jars. **(2 marks)**
- Students are to do only **one** of 4.a., 4.b., or 4.c. Answers will vary. Mark this assignment according to the guidelines included in the instructions within the question. **(20 marks)**

Project Topic F. Agricultural History (30 marks)

- Civilizations that had a developed economy, and the location of these civilizations relative to present-day countries include
 - Mesopotamians – Middle East
 - Sumerians – Middle East
 - Egyptians – Middle East, North Africa
 - Romans – Europe and the Middle East
 - Mayas – Central America
 - Incas – Central America
 - Europeans – Europe and North America**(10 marks)**
- Students are to do **one** of 2.a. or 2.b. Answers will vary. Mark this assignments according to the guidelines included in the instructions within the question. **(20 marks)**

Project Topic G. Home Gardening (30 marks)

- Answers will vary. Check to see that the values for the amounts of vegetables and length of row in the chart are reasonable. Use the information from the chart in (Part B) Section 1: Activity 2 in the student module as a guide to correct the student's answers. **(5 marks)**
- Answers will vary. Use the information from the chart located in the Learning Facilitator's Manual under Section 1 (Part B): Activity 2, Project Topic G, question 6 as a guide to correct students' answers. **(10 marks)**
- Answers will vary. Look for such things as orientation, indications of slope and wind direction, and labelling of areas for different vegetables. Row spacing should be as indicated and be consistent with recommended values as given in the chart in the answer to question 2. Vegetables with similar growing conditions should be together, and tall plants should not be placed in front of short plants (resulting in unwanted shading). **(5 marks)**
- Answers will vary. Reports on growing plants indoors should include starting date, time to transplant, and instructions for starting plants. Reports on the construction of an outdoor growth chamber should provide instructions for completing a simple protective structure. **(10 marks)**

Note: Students should now read the Module Summary and then turn to their Assignment Booklets and complete the Final Module Assignment for Part B.

Final Module Assignment for Part B: Assignment Answer Key (20 marks)

Often, student projects of this nature are difficult because their rationale is difficult to understand. For this reason, 20% of the grade on this assignment is based on how well students met their own objectives and whether they were able to learn from their own mistakes. Lack of effort, however, is not an acceptable reason for not completing this assignment.

1. a. to e. Check to see how well students evaluated their achievements for Project 1, as compared to the goals they identified in Section 1 and their actual results in Section 2. **(10 marks)**
2. a. to e. Check to see how well students evaluated their achievements for Project 2, as compared to the goals they identified in Section 1 and their actual results in Section 2. **(10 marks)**

Note: 1. A final grading for Module 4 can now be determined for students who completed Part B.

2. **Students should now have completed and been assigned gradings for all four modules of this course. A final grading for Agriculture: Land and Life/Year Three should now be determined.**

TEACHER QUESTIONNAIRE FOR AGRICULTURE: YEAR THREE

This is a course designed in a new distance-learning format, so we are interested in your responses. Your constructive comments will be greatly appreciated so that a future revision may incorporate any necessary improvements.

Teacher's Name _____ Area of Expertise _____

School Name _____ Date _____

Design

1. The modules follow a definite systematic design. Did you find it easy to follow?

☐ Yes ☐ No If no, explain.

2. Did your observations reveal that the students found the design easy to follow?

☐ Yes ☐ No If no, explain.

3. Did you find the Learning Facilitator's Manual helpful?

☐ Yes ☐ No If no, explain.

4. Part of the design involves stating the objectives in student terms. Do you feel this helped the students understand what they were going to learn?

☐ Yes ☐ No If no, explain.

5. The Learning Facilitator's Manual contains module activity and Assignment answers. Did you find these helpful?

☐ Yes ☐ No If no, explain.

6. Did the Follow-up Activities prove to be helpful?

☐ Yes ☐ No If no, explain.

7. Were students motivated to try these Follow-up Activities?

☐ Yes ☐ No If no, give details.

8. Suggestions for computer and video activities are included in the course. Were your students able to use these activities?

☐ Yes ☐ No Comment on the lines below.

9. Were the assignments appropriate?

☐ Yes ☐ No If no, give details.

10. Did you fax assignments? ☐ Yes ☐ No

11. If you did fax, did you get satisfactory results from using this procedure?

☐ Yes ☐ No If no, give details.

Instruction

1. Did you find the instruction clear?

☐ Yes ☐ No If no, give details.

2. Did your observations reveal that the students found the instruction interesting?

☐ Yes ☐ No If no, give details.

3. Did you find the instruction adequate?

☐ Yes ☐ No If no, give details.

4. Was the reading level appropriate?

☐ Yes ☐ No If no, give details.

5. Was the work load adequate?

☐ Yes ☐ No If no, give details.

6. Was the content accurate and current?

☐ Yes ☐ No If no, give details.

7. Did the content flow consistently and logically?

☐ Yes ☐ No If no, give details.

8. Was the transition between booklets smooth?

☐ Yes ☐ No If no, give details.

9. Was the transition between print and media smooth?

☐ Yes ☐ No If no, give details.

Additional Comments

Thanks for taking the time to complete this survey. Your feedback is important to us.

Fax Number: 674-6686

Instructional Design and Development Unit
Alberta Distance Learning Centre
Box 4000
Barrhead, Alberta
T7N 1P4

